

1954.

ORGANIZATION OF THE DEPARTMENT AS AT 30th JUNE 1954.
QUEENSLAND.

ANNUAL REPORT

OF THE

**DEPARTMENT OF AGRICULTURE
AND STOCK**

FOR

THE YEAR 1953-54.

PRESENTED TO PARLIAMENT BY COMMAND.

BRISBANE:

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ORGANISATION OF THE DEPARTMENT AS AT 30th JUNE, 1954.

SECRETARY FOR AGRICULTURE AND STOCK Hon. H. H. Collins, M.L.A.

CENTRAL ADMINISTRATION—

Under Secretary		A. F. Bell, M.Sc., D.I.C., A.R.A.C.I.
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Assistant Under Secretary		W. T. Gettons, A.I.C.A.
Special Administration Officer		H. Barnes.
Officer in Charge, Information Services		C. W. Winders, B.Sc.Agr.
Accountant		E. C. Sadler, A.A.U.Q.

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Director of the Division W. A. T. Summerville, D.Sc.

Agriculture Branch—

Director of Agriculture W. J. S. Sloan, M.Sc.Agr.

Regional Experiment Stations—

Director of Regional Experiment Stations W. G. Wells.

Horticulture Branch—

Director of Horticulture S. A. Trout, M.Sc., Ph.D.

Science Branch—

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Chemical Laboratory—

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Animal Health Stations—

Director of Research J. Legg, B.Sc., D.V.Sc., M.R.C.V.S.

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Director of Sheep Husbandry G. R. Moule, B.V.Sc.

Cattle Husbandry Branch—

Officer in Charge R. D. Chester, B.V.Sc.

Pig Branch—

Officer in Charge F. Bostock.

Poultry Branch—

Officer in Charge P. Rumball, R.D.A.

DIVISION OF DAIRYING—

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Field Services Branch—

Director of Field Services R. A. Paul, B.Sc.Agr.

Research Branch—

Director of Research L. E. Nichols, B.Sc.Agr., A.R.A.C.I.

DIVISION OF MARKETING—

Director of Marketing H. S. Hunter.

Assistant Director of Marketing C. H. P. Defries, H.D.A., B.Com., A.F.I.A.

Standards Branch—

Standards Officer F. B. Coleman

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Key to Departmental Services.

Centre.	Full-time Services Provided.	Centre.	Full-time Services Provided.
ALLORA	Dairying.	JANDOWAE	Dairying, Stock Inspection.
ALPHA	Stock Inspection.	JULIA CREEK	Sheep and Wool, Sheep Field Station.
ATHERTON	Agriculture, Cattle Husbandry, Pig Raising, Poultry Raising, Stock Inspection, Veterinary Services.	KAIRI	Regional Experiment Station.
AYR	Agriculture, Horticulture, Plant Pest Control, Stock Inspection, Regional Experiment Station.	KILLARNEY	Dairying, Stock Inspection.
BARCALDINE	Sheep and Wool, Veterinary Services.	KINGAROY	Agriculture, Dairying, Stock Inspection, Veterinary Services.
BEAUDESERT	Agriculture, Dairying, Pig Raising, Stock Inspection.	LAIDLEY	Dairying.
BEENLEIGH	Dairying, Horticulture.	LONGREACH	Sheep and Wool, Stock Inspection.
BIGGENDEN	Dairying.	MACKAY	Agriculture, Dairying, Stock Inspection.
BILOELA	Agriculture, Dairying, Pig Raising, Stock Inspection, Regional Experiment Station.	MALANDA	Dairying, Dairy Research Laboratory.
BLACKALL	Sheep and Wool.	MAREEBA	Agriculture, Stock Inspection, Tobacco Station.
BOONAH	Agriculture, Dairying, Stock Inspection.	MARYBOROUGH	Dairying, Horticulture, Stock Inspection, Veterinary Services.
BOONDOOMA	Stock Inspection.	MILES	Cattle Husbandry, Stock Inspection.
BOWEN	Horticulture, Stock Inspection.	MILLMERRAN	Stock Inspection.
BRISBANE	All services.	MONTO	Dairying, Stock Inspection.
BUNDABERG	Agriculture, Dairying, Horticulture, Poultry Raising, Stock Inspection.	MOUNT ISA	Stock Inspection.
CABOOLTURE	Dairying, Horticulture.	MUNDUBBERA	Dairying, Stock Inspection.
CADARGA	Stock Inspection.	MURGON	Dairying, Pig Raising, Stock Inspection, Dairy Research Laboratory.
CAIRNS	Horticulture, Plant Pest Control, Stock Inspection, Horticultural Experiment Station.	NAMBOUR	Dairying, Horticulture, Plant Disease and Pest Control, Stock Inspection.
CHARLEVILLE	Sheep and Wool, Stock Inspection, Veterinary Services.	NANANGO	Dairying, Stock Inspection.
CHARTERS TOWERS	Stock Inspection.	NORMANTON	Stock Inspection.
CHINCHILLA	Dairying, Stock Inspection.	Oakey	Dairying, Stock Inspection.
CLARE	Agriculture, Experiment Station.	ORMISTON	Horticulture, Horticultural Experiment Station.
CLERMONT	Cattle Husbandry, Stock Inspection.	PALMWOODS	Horticulture.
CLONCURRY	Stock Inspection, Veterinary Services.	PITTSWORTH	Cattle Husbandry, Dairying, Stock Inspection.
COOLANGATTA	Horticulture, Stock Inspection.	PROSTON	Dairying.
COOROY	Dairying, Horticulture.	QUILPIE	Stock Inspection.
CROW'S NEST	Dairying, Stock Inspection.	ROCKHAMPTON	Agriculture, Horticulture, Plant Pest Control, Dairying, Veterinary Services, Cattle Husbandry, Stock Inspection, Poultry Raising.
CUNNAMULLA	Sheep and Wool, Stock Inspection, Veterinary Services.	ROMA	Sheep and Wool, Stock Inspection, Veterinary Services.
DALBY	Dairying, Sheep and Wool, Stock Inspection.	SOUTH JOHNSTONE	Agriculture, Cattle Husbandry, Bureau of Tropical Agriculture.
EMERALD	Agriculture, Sheep and Wool, Stock Inspection.	SOUTHPORT	Dairying, Horticulture, Stock Inspection.
ESK	Agriculture, Dairying.	STANTHORPE	Horticulture, Plant Pest Control.
GATTON	Agriculture, Dairying.	ST. GEORGE	Sheep and Wool, Stock Inspection.
GAYNDAH	Agriculture, Cattle Husbandry, Horticulture, Stock Inspection, Beef Cattle Research Station.	TOOGOLAWAH	Stock Inspection.
GLADSTONE	Dairying, Stock Inspection.	TOOWOOMBA	Agriculture, Dairying, Horticulture, Pig Raising, Plant Disease and Pest Control, Poultry Raising, Stock Inspection, Veterinary Services.
GOOMBUNGEE	Dairying.	TOWNSVILLE	Horticulture, Cattle Husbandry, Veterinary Services, Stock Inspection, Poultry Raising.
GOONDIWINDI	Agriculture, Stock Inspection.	WALLAN-GARRA	Horticulture.
GYMPIE	Agriculture, Cattle Husbandry, Dairying, Horticulture, Stock Inspection.	WANDOAN	Agriculture, Stock Inspection.
HELIDON	Stock Inspection.	WARWICK	Agriculture, Cattle Husbandry, Dairying, Pig Raising, Sheep and Wool, Stock Inspection.
HERMITAGE	Regional Experiment Station.	WINTON	Sheep and Wool, Stock Inspection.
HUGHENDEN	Sheep and Wool, Stock Inspection.	WONDAI	Stock Inspection.
INGHAM	Stock Inspection.	WOWAN	Dairying.
INGLEWOOD	Agriculture.	WROTHAM PARK	Gulf Exploratory Farm.
INJUNE	Stock Inspection.	YARRAMAN	Stock Inspection.
INNISFAIL	Horticulture, Dairying, Stock Inspection.		
IPSWICH	Dairying, Poultry Raising, Stock Inspection.		

REPORT OF THE DEPARTMENT OF AGRICULTURE AND STOCK FOR THE YEAR 1953-54.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

Dear Sir,—I have the honour to submit a Report covering the activities of this Department for the year ending June 30th, 1954. In the immediately succeeding pages will be found the reports of the Directors of the three production Divisions and the Director of Marketing. In the balance of the Report follow the more detailed activities of the 15 constituent Branches. General production statistics recorded in consolidated tables 1 and 2 on pages 2 and 3 indicate the absolute and relative production for the principal crops and animal industries.



Mr. A. F. Bell.

The year has been notable for marked variations from normal climatic conditions, with consequent fluctuations in output. Following a dry winter, spring conditions were reasonably good, but early summer rainfall was deficient in many zones of the State and summer crops suffered in consequence. The month of February registered record or near-record rainfalls in most areas and flooding and cyclonic storms caused widespread damage. The rainy season ceased abruptly and the autumn and early winter were dry except on the coast and in the north. Winter temperatures have been unusually mild and frosts infrequent. In late winter July rains were well above normal and spring rains have so far been well in excess of normal although subnormal temperatures have slowed plant growth.

As might be expected from this weather record production has been "up and down." Another record sugar crop has been grown. In spite of the fact that there was no effective rain between early May and late August the wheat crop of 9,750,000 bushels was the fifth highest on record. Summer field crops produced lightly but the pineapple crop was a record and the tobacco a near record. Beef production was also a record and wool production (worth £63½ millions) abreast of recent years, but dairy production was below average.

Tables 1 and 2 record production statistics in the form of five-year averages for the immediate pre-war and post-war periods, together with single year production over the past five years. It is pleasing to be able to record that the recent upward trend in cattle, sheep, and pig numbers continues. Any decline in the volume of other agricultural crops was more than compensated by the record sugar crop which earned more than £50 millions.

B

MARKETS.

The "war" era in overseas marketing has now drawn to a close. The principal buyer, the United Kingdom, has now terminated rationing and virtually all commodity purchase controls. Trade has returned to "normal" channels and this in itself has brought some difficulties: The younger generation of business men had in fact come to look on controlled marketing as normal and it has become necessary for them to learn, and the older men to re-learn, the techniques of free marketing.

In spite of many forecasts to the contrary the relaxing of rationing and controls in Britain has not resulted in price rises—but rather the reverse. This is due in great part to the action of the United Kingdom Government in stockpiling very considerable reserves which could be released to counter the effect of any tendency towards buying sprees. The price of eggs has fallen seriously, while prices for butter and cheese are falling in the face of increasing competition from quality produce.

Floor prices for meat are protected in the current 15-year agreement but sales on the trader to trader basis become fully operative as from October 1st, 1954. Although a rise in price is again widely forecast it must be conceded that experience with other commodities does not support this view. Queensland sugar production is affected by world prices to the extent that about 25 per cent. of the production is sold at world market prices plus Canadian or U.K. preference; recent free market prices have been below the 3.25 cents minimum sought under the International Sugar Agreement and the International Sugar Council is now examining remedial measures.

Wheat prices have fallen somewhat but the chief difficulty has been the slow movement of wheat following good crops in both hemispheres, coupled with the withdrawal of the United Kingdom from the International Wheat Agreement. However, latest reports indicate some fall in estimates of overseas crops. Decreased demand and price falls have also been experienced in the coarse feed grains, edible oils, and processed milks. Pineapples, which have been an important dollar earner in the post-war years, are meeting acute competition on the Canadian market and increasing competition elsewhere.

The unfortunate effect of these market trends has been that Australia is gradually becoming more and more dependent upon wool and (to a less extent) meat, for the maintenance of its overseas credits. It is obvious that every effort must be made to open up new markets for these

TABLE 1.
PASTORAL AND DAIRYING STATISTICS.
(SOURCE—QUEENSLAND GOVERNMENT STATISTICIAN AND COMMONWEALTH STATISTICIAN.)

	Average 1934-35— 1938-39.	Average 1944-45— 1948-49.	1949-50.	1950-51.	1951-52.	1952-53.	1953-54. (a)
Beef Cattle (number)	4,631,482	4,797,681	4,872,018	5,293,350	5,137,715	5,378,397	5,793,000
Cattle and Calves Slaughtered (number) (b)	1,046,111	1,019,621	1,101,914	1,181,442	1,028,722	1,272,585	1,346,508
Beef and Veal produced (tons)	180,717	186,354	211,496	232,398	177,608	252,495	259,702
Dairy Cattle (number)	1,387,011	1,417,892	1,432,760	1,440,198	1,296,659	1,372,998	1,383,000
Total milk produced for all purposes (,000 gal.)	278,227	255,810	281,125	278,111	181,148	285,757	250,000
Butter produced (tons)	54,722	43,453	48,785	47,911	28,211	49,426	42,194
Cheese produced (tons)	5,077	9,778	9,052	8,678	4,700	9,439	6,749
Sheep (number)	21,060,513	17,912,361	17,582,152	17,477,578	16,163,518	17,029,623	18,194,000
Wool production (,000 lb.)	164,971	161,401	162,256	154,667	138,767	163,149	172,000
Sheep slaughtered (number) (b)	1,029,054	1,201,301	846,470	664,789	731,635	953,838	938,491
Mutton produced (tons)	19,192	20,712	16,024	12,467	13,082	18,572	17,445
Lambs slaughtered (number) (b)	72,178	111,111	112,847	79,839	97,348	121,781	133,533
Lambs produced (tons)	974	1,568	1,649	1,100	1,338	1,799	1,807
Pigs (number)	294,776	395,814	391,836	374,991	316,529	335,809	384,000
Pigs slaughtered for pork (number) (b)	260,928	155,897	227,927	210,992	165,149	115,091	129,447
Pigs slaughtered for bacon and ham (number) (b)	264,306	308,930	276,255	248,989	204,493	285,326	329,727
Pork produced (tons)	9,867	9,202	12,911	11,751	8,604	6,548	7,132
Bacon and ham produced (tons)	9,269	10,707	10,018	8,764	7,669	9,510	10,616

(a) Preliminary figures.

(b) Slaughtered for human consumption.

and other commodities, to present our goods in the most attractive and saleable form, and to cut costs to the minimum. In this connection it is of interest to note that the Queensland Council of Agriculture and its constituent Commodity Boards, assisted by the Commonwealth Bank, have provided the funds to send the Director of Marketing on an overseas study tour.

Although difficult, the position is not such as to justify a lapse into pessimism. The current situation is due in part to troubles associated with the change in the United Kingdom marketing structure, and two years of above-average world production. But it should be remembered that in spite of temporary setbacks the world requirement for primary produce is continuously increasing. The latest statistics issued by the United Nations Food and Agriculture Organisation show that world population is increasing by the almost unbelievable total of 85,000 every day. In these circumstances there must be a continuously increasing requirement of food and clothing.

SOME ACHIEVEMENTS IN THE MAJOR INDUSTRIES.

The circumstances recorded in the foregoing section make it plain that a serious national effort is required to increase the efficiency of production. No one can seriously question this, but in making pleas for better performance there is perhaps a danger of forgetting what has already been achieved in Queensland primary industries. It is in fact only by taking encouragement from past performances that the problems ahead will be tackled with the confidence and energy they require.

In its major industry Queensland produces the highest quality wool in the Commonwealth and, hence, in the world. The yield of wool per sheep is being continually increased and is now one pound better than in the twenties. On present prices and sheep numbers an increase of one pound weight per fleece would earn nearly £10,000,000 more per year.

The Queensland sugar industry is second only to Hawaii in the production of sugar per acre per month and undoubtedly leads in the production per man. The quantity of sugar

produced per acre is now over 40 per cent. greater than it was 25 years ago.

The quantity of beef produced per head of cattle depastured has increased by the remarkable figure of 60 per cent. in the past 30 years.

The average yield of wheat in Queensland over the past ten years has been 28 per cent. above the Australian average while quality is well above all other States. It is produced largely from wheat varieties bred in Queensland.

A recent careful survey conducted by the Division of Marketing indicated that the Queensland average annual egg production per hen was 168, compared with an Australian average of 144 (determined by the Bureau of Agricultural Economics) and the United States published average of 178.

The yield of tobacco is above the Australian average in quantity and quality. Tobacco yields per acre in North Queensland have increased by 80 per cent. in the last 15 years.

THE PROBLEM OF COSTS.

The ultimate objective of research and extension work in primary industry is increased production and high quality. At the same time, of course, scientific institutions such as Departments of Agriculture must concern themselves closely with efficiency in production and its relation to costs. Although we live in an under-fed and ill-clothed world many potential customers have a very limited purchasing power and their ability to consume is determined by their ability to pay.

It is becoming increasingly urgent for Australia to reduce costs in primary production to the fullest extent possible. Costs obviously fall into two categories—those which are determined by national standards and so lie beyond the control of the primary producer, and those on-the-farm costs which are within his control. It is, of course, the latter with which the Department is directly concerned; these costs may be reduced by means such as the use of plants or animals with greater inherent yielding capacity; better husbandry; the reduction of waste caused by diseases and parasites; the elimination of unnecessary operations; greater attention to quality; and efficient use of by-products.

TABLE 2.
AGRICULTURAL AND HORTICULTURAL STATISTICS.
(SOURCE—QUEENSLAND GOVERNMENT STATISTICIAN.)

	Average 1934-35— 1938-39.	Average 1944-45— 1948-49.	1949-50.	1950-51.	1951-52.	1952-53.	1953-54. (a)
Sugar Cane (b)—							
Cut for crushing (acres)	247,092	244,554	275,313	257,562	273,371	274,757	332,703
Cane production (tons)	5,181,124	5,073,804	6,518,042	6,691,706	5,005,172	6,841,536	8,715,063
Yield per acre (tons)	20.9	20.7	23.7	25.9	18.3	24.9	26.3
Sugar Manufactured (tons)	757,560	707,144	896,413	879,844	704,341	934,614	1,220,383
Wheat—							
Area (acres)	340,055	408,570	600,013	558,780	454,543	724,495	579,969
Production (bushels)	4,766,927	8,175,054	11,778,495	8,785,254	6,631,644	18,662,391	10,180,363
Yield per acre (bushels)	14.0	20.0	19.6	15.7	14.6	25.8	17.5
Maize—							
Area (acres)	174,628	132,280	115,550	112,467	111,181	108,230	114,735
Production (bushels)	3,271,919	3,119,961	3,392,817	3,028,899	2,438,871	2,650,365	3,041,607
Yield per acre (bushels)	18.7	23.6	29.4	26.9	21.9	24.5	26.5
Barley—							
Area (acres)	9,777	18,043	25,074	26,099	28,158	71,879	56,076
Production (bushels)	153,028	392,609	578,193	489,075	450,222	2,108,979	1,138,839
Yield per acre (bushels)	15.7	21.8	23.1	18.7	16.0	29.3	20.3
Oats—							
Area (acres)	8,542	23,690	20,456	16,998	20,339	56,403	13,480
Production (bushels)	102,819	419,350	337,506	221,202	262,812	1,302,528	199,026
Yield per acre (bushels)	12.0	17.7	16.5	13.0	12.6	23.1	14.8
Canary Seed—							
Area (acres)	19,233	11,604	13,016	11,932	19,971	21,124	4,104
Production (bushels)	91,616	101,708	126,762	125,961	70,575	339,135	29,427
Yield per acre (bushels)	4.8	8.7	9.7	10.6	3.5	16.1	7.2
Millet, Panicum and Setaria—							
Area (acres)	(c)	21,661	14,832	20,225	16,008	16,461	39,382
Production (bushels)	(c)	279,521	265,734	314,382	173,994	211,089	556,401
Yield per acre (bushels)	(c)	12.9	17.9	15.5	10.9	12.8	14.1
Sorghum—							
Area (acres)	(c)	67,405	99,362	166,311	169,558	190,619	181,820
Production (bushels)	(c)	1,511,831	2,157,717	3,683,286	2,651,799	3,239,133	4,039,779
Yield per acre (bushels)	(c)	22.4	21.7	22.1	15.6	17.0	22.2
Lucerne Hay—							
Area (acres)	50,600	43,942	41,455	33,947	29,791	45,806	51,625
Production (tons)	84,808	93,005	98,484	87,177	67,106	106,618	113,635
Yield per acre (tons)	1.7	2.1	2.4	2.6	2.3	2.3	2.2
Wheaten Hay—							
Area (acres)	5,388	9,723	3,835	3,755	6,807	8,284	6,279
Production (tons)	5,379	10,006	4,844	4,638	6,123	11,476	8,785
Yield per acre (tons)	1.0	1.0	1.3	1.2	0.9	1.4	1.4
Arrowroot—							
Area (acres)	888	614	621	699	507	356	348
Production (tons)	9,456	6,956	7,506	7,849	5,034	4,054	2,852
Yield per acre (tons)	10.65	11.33	12.09	11.23	9.93	11.39	8.19
Cotton—							
Area (acres)	55,504	9,541	2,688	2,952	4,480	5,866	8,965
Production (lb.)	16,598,485	3,447,003	718,513	1,102,482	1,405,991	2,184,268	5,132,145
Yield per acre (lb.)	299	361	267	373	314	372	572
Linseed—							
Area (acres)	..	(e)	9,533	14,986	28,580	25,875	3,757
Production (bushels)	..	(e)	89,958	142,434	166,965	269,244	18,072
Yield per acre (bushels)	..	(e)	9.44	9.05	5.84	10.40	4.81
Peanuts—							
Area (acres)	14,542	28,375	17,697	16,656	13,312	18,920	35,625
Production (lb.)	13,641,059	32,258,355	17,710,141	11,896,145	10,159,806	18,901,157	(f)
Yield per acre (lb.)	938	1,137	1,001	714	763	999	(f)
Potatoes—							
Area (acres)	12,144	13,155	11,624	10,783	11,465	11,641	9,382
Production (tons)	20,929	29,332	30,681	24,725	33,001	35,051	32,628
Yield per acre (tons)	1.7	2.2	2.6	2.3	2.9	3.0	3.5
Pumpkins—							
Area (acres)	21,829	35,778	28,349	26,292	26,373	28,016	25,231
Production (tons)	52,248	81,063	72,221	58,260	53,130	69,464	65,858
Yield per acre (tons)	2.4	2.3	2.5	2.2	2.0	2.5	2.6
Tobacco—							
Area (acres)	3,659	1,921	2,677	4,142	5,038	4,339	4,065
Production (lb.)	2,033,736	1,580,365	2,539,592	2,144,278	4,666,699	3,431,300	3,598,749
Yield per acre (lb.)	556	823	949	518	926	791	885
Apples—							
Area (acres) (bearing)	3,320	4,583	4,522	4,740	4,928	4,965	5,090
Production (bushels)	252,756	369,892	536,742	448,129	494,510	204,754	499,699
Yield per acre (bushels)	76	81	119	95	100	41	98
Bananas—							
Area (acres) (bearing)	6,016	6,022	5,734	5,240	4,036	3,662	4,531
Production (bushels) (d)	651,558	628,515	580,948	596,255	446,874	384,836	532,818
Yield per acre (bushels) (d)	108	104	101	114	111	105	117
Citrus—							
Area (acres) (bearing)	3,303	4,290	4,373	4,355	4,451	4,512	4,600
Production (bushels)	349,180	530,316	494,640	597,212	470,271	431,753	542,057
Yield per acre (bushels)	106	124	113	137	106	96	118
Pineapples—							
Area (acres) (bearing)	4,766	5,479	6,807	6,957	5,549	6,258	7,105
Production (dozens)	1,624,362	1,788,261	2,374,748	2,507,391	1,785,896	2,209,185	3,187,648
Yield per acre (dozens)	341	327	349	360	322	353	448
Beans, French—							
Area (acres)	2,733	5,161	4,579	4,809	4,930	5,205	4,604
Production (bushels)	267,842	444,394	509,931	512,964	452,544	555,168	506,930
Yield per acre (bushels)	98	86	111	107	92	107	110
Onions—							
Area (acres)	1,155	2,273	2,371	2,399	2,527	2,813	2,497
Production (tons)	3,468	10,016	13,137	7,256	9,691	11,542	11,957
Yield per acre (tons)	3.0	4.4	5.5	3.0	3.8	4.1	4.8
Tomatoes—							
Area (acres)	5,137	7,739	5,589	6,069	5,511	5,833	5,058
Production (bushels)	502,171	779,676	643,246	614,914	641,043	732,613	671,300
Yield per acre (bushels)	98	100	115	101	116	126	133

(a) Preliminary figures.

(b) Sugar figures supplied by Bureau of Sugar Experiment Stations.

(c) Very small amounts. Exact figures not available.

(d) Revised figures.

(e) In 1947-48, 112 acres produced 1,176 bushels, and in 1948-49, 4,139 acres produced 35,019 bushels.

(f) Not available.

Lower-cost procedures which have been initiated or further developed by Departmental action during the year are illustrated by the following:—

In the dairy industry the survey based on five years of group herd recording was completed and has given some very important leads. A total of 55 herd-recording groups have been established and 40,000 cows in more than 1,000 herds are under continuous test, thus giving a highly reliable picture of conditions in this industry. The survey has shown that cows calved in the months of July-September (31 per cent.) yielded nearly 25 per cent. more butter than cows calved in January-March (19 per cent.) and about 10 per cent. more than those calved in the remainder of the year. It is not unreasonable to expect that 80 per cent. of the cows could be calved in July-September instead of the present 31 per cent; if this were effected it alone would annually contribute another 4,300 tons of butter, worth nearly £2,000,000.

With assistance from the Commonwealth Dairy Extension Grant, demonstrations of improved methods are now being carried out on many farms. The "demonstration farms" which were operated as such during the first five years of the Grant showed an average increase in their own production of 33 per cent. for 1952/53 compared with 1948/49, whereas the State increase was only 4 per cent. The methods demonstrated are applicable to most dairy areas of the State and if the State as a whole had made a similar percentage increase this would have resulted in another 30 million pounds of butter worth about £6 millions.

In the Horticulture Branch it has been found that spraying summer pineapples with a dilute solution of ANA (alpha-naphthalene-acetic acid) about eight weeks before harvesting increased the weight of fruit by more than 20 per cent. Thinning of plums by hand is a laborious operation; promising results have been obtained in thinning by spraying with a new chemical. Wastage in citrus was very much reduced by wrapping the fruit in paper impregnated with diphenyl instead of in plain paper. Soft vegetables such as lettuce, cauliflower, and cabbage have been kept for several weeks in freshly-packed condition by placing in cold storage in plastic bags; the plastic not only prevents dehydration but holds a carbon dioxide concentration from respiration which is sufficient to kill moulds. Waxing of bananas in the bunch greatly reduces blemishes and rotting and this treatment is rapidly passing from the laboratory to trade practice. During the year 122,500 pedigreed citrus buds were distributed to nurserymen for the propagation of better-yielding citrus trees.

The Entomology Branch, concentrating on tobacco problems, has developed techniques for the new insecticides dieldrin and aldrin. These have now displaced the standard lead arsenate spray in Queensland with the result that poisonous spray residues have ceased to be a problem. In 1952 18.6 per cent. of the tobacco crop was prohibited from sale because of the residue of arsenic left after spraying to control insect pests.

Hybrid maize seed production has reached the stage when all demands can be met, with some

carry-over for emergency. The use of suitable hybrid maize varieties results in an increased yield per acre of about 25 per cent. over the open-pollinated varieties.

Several new varieties of crop plants bred by the Department's plant breeders were released during the year.

In its first full year of operation the fleece-testing laboratory has demonstrated its usefulness to sheep breeders, enabling them to measure rather than to guess various wool characters. It is computed that this service can double the rate of sheep improvement by breeding.

There remains a very wide scope for action by organised primary industry to develop and expand the sale of by-products rather than to rely for so much of the income on the sale of the major product. In this connection it is proposed that the Director of Marketing should visit the countries of Western Europe where primary industry co-operatives have combined to diversify sales. After all, it is the producers who are directly interested in this form of trade and its development should not be left to the chance interest of commerce.

Research has shown that skim-milk powder and buttermilk powder improve taste, texture, and keeping quality of bread, while milk and cheese are sold in much more varied form in Europe and America than in Australia. The dairy industry as a whole should explore co-operative action in both the development of these products and the marketing of them. Similarly there is scope in the sugar industry for the development of more, and more lucrative, avenues of sale of wax, bagasse, molasses, and their products; molasses is an excellent energy stock food, alone or in combination with roughage, its value at present grain prices being several times its value as raw material for distilleries.

DRY FARMING.

An important and interesting example of adaptation of practice to environment is furnished by last season's wheat crop. On the Darling Downs, where 90 per cent. of the State's wheat crop is produced, planting normally takes place in late May or early June. In the 1953 season no effective rain fell between the first week in May and the last week in August. Nearly half the crop was planted on the May rains but the onset of the dry weather curtailed acreage and postponed planting of the remainder until early September. Nevertheless it is estimated that a crop of 9,750,000 bushels was harvested in November-December at an average yield of 19 bushels per acre.

Over the past decade a great deal of research has been carried out on the water requirements of Queensland crops, and particularly those of grain sorghum and wheat. It has been shown, for example, that on the Biloela Regional Experiment Station a grain sorghum crop must absorb through its roots the equivalent of 10½ acre-inches (or 230,000 gallons) of water to produce a 40 bushel per acre crop. Since during the period of growth no more than 6 inches absorption of rain by the soil can be expected, it is necessary to have at least 4½ inches of water stored in the soil and subsoil before a good crop

can be assured. For every inch of stored water over $4\frac{1}{2}$ inches an increase in crop of six bushels per acre can be expected.

Similarly it has been found that six acre-inches of water are necessary to produce a wheat crop of 30 bushels. Thus if six inches of available water can be stored in the top three feet of soil a 25-30 bushel crop can be produced if sufficient rain falls in May or early June to wet the top couple of inches for planting. In other words only relatively light planting rain is necessary to produce a fair to good crop if the crop's moisture requirements are already stored in the ground.

On the basis of these facts the extension services during the post-war period have emphasised the necessity for conserving as much moisture as possible by getting it absorbed into the subsoil of the wheat fields during the preceding summer rains. Farming practices on the Downs have undergone considerable modification in this past decade with a view to eliminating run-off and getting the monsoonal rain down into the soil.

In the result, the area planted in May, 1953 (about 45 per cent.) produced a yield of over 22 bushels per acre. In assessing the importance of this performance it must be remembered that for fourteen weeks of the growing period this crop received no effective rain; moreover this yield compares very favourably with the previous 10-year State and Commonwealth averages of 19.7 and 14.2 bushels per acre respectively. Ten years ago the thought of such a yield under these circumstances would have appeared almost fantastic. It has been achieved by a better understanding of the water requirements of the crop—and the modification of farming practices accordingly—and by the breeding of varieties more suitable to hard conditions. The slow-maturing varieties Lawrence and Celebration were particularly well suited to the early May plant.

The September-planted crops yielded at the rate of about 16 bushels per acre but it must be remembered that these crops had only a three months growing season and under these conditions the yield was extraordinarily good. It was possible only through the availability of fast-maturing, rust-resistant, varieties; of these Spica and Festival proved very useful.

Another dry-farming development is seen in the increasing interest in the growth of lucerne as a row crop. In areas of lower rainfall lucerne requires too much water for successful growth as a sward and the thinned sward is heavily invaded by weeds in the wet season. Yet lucerne is by far our most valuable high-protein legume and these above-mentioned disabilities can be largely overcome by cultivation in rows. About 2,000 acres of lucerne have been planted in rows in the new Wandoan dairying area and will provide high-grade grazing at a time when it is needed most.

DEVELOPMENT AND CONSERVATION OF LAND RESOURCES.

In past years, in this Report, attention has been drawn to the developmental potential of the brigalow country beyond the coastal range and the wallum country of the north coast.

Running northwards from Goondiwindi, through Wandoan to the Dawson, is a tract of grey-black soil of which about 23 million acres is still under brigalow "scrub." Of this area about two-thirds must be classed as good soil and much of it is in the zone with a fair winter rainfall component. This part of Queensland is obviously destined to be used for intensified animal production in association with cropping, particularly cereals. At the same time the clearing of this land for pastures or the plough presents particular difficulties due to the unusual vitality of the brigalow.

Following preliminary experiments in the killing of brigalow with new weedicides the Government Botanist paid a visit to the United States in the latter part of 1952 and there made a first-hand study of the destruction of mesquite by aerial spraying. Since then, with valued co-operation from pastoralists, chemical manufacturers and an aviation company, a series of large-scale aerial spraying experiments has been carried out.

Although the results of these experiments cannot be definitely assessed as yet, it can at least be said that there is very good prospect of achieving a "kill" of brigalow at a cost of approximately 45s. to 55s. per acre. Graziers have been so impressed that already some 50,000 acres have been aerially sprayed during the past year.

A further experiment on the destruction of eucalypt regrowth in pastoral areas is now being carried out on the cattle research station at Brian Pastures, near Gayndah.

In marked contrast to the fertile brigalow soil is the plantfood-deficient soil of the wallum. This area has not yet been precisely mapped but it can be said that there is at least 2-3 million acres on the coastal plain between Brisbane and Gladstone. The term "wallum" covers a number of soil types but in general they are deficient in lime and phosphate, and the minor elements, copper, zinc, and probably molybdenum. They are also (as are most soils) deficient in nitrogen so that utilisation would involve the growth of legumes or applications of nitrogenous fertilizer.

This is, admittedly, an imposing array of shortcomings. On the other hand, this strip enjoys one of the best rainfalls in Queensland, it is handy to large centres of population, it is well served by rail and road, and amenities such as electricity are close to hand. If the plantfood deficiencies could be economically overcome it should become the milk, beef-fattening, and perhaps fat lamb supply area for a growing Brisbane.

The existence of lime, phosphate, nitrogen, and copper deficiencies in this general area have long been known and corrected where necessary in the sugar and pineapple fields and the pine tree plantations of the Forestry Department. It is obvious, however, that if full development is to be achieved much of the land must go under pastures.

The problem of establishing and maintaining suitable mixed pastures on wallum country is now being investigated by the C.S.I.R.O. at Beerwah and, along with other crops, by this Department on a different soil at Cooloom. The

problem is not only one of providing the necessary mineral plantfoods but also the equally important one of ensuring the proper nodulation of the clovers and other legumes; this aspect is being given particular attention.

These experiments are only in their exploratory stages, but there is every indication that the main technical problems will be solved in a very few years.

At least of equal importance to the development of new tracts of country is the maintenance in full productive capacity of the older developed areas. This calls for the continuous application of measures designed to prevent soil erosion and maintain soil fertility. Such conservation measures are based on the principles of sound farming—they are only in minor degree dependent on the perhaps more spectacular building of earth works with massive machines. For this reason the Department did not set up a separate sub-department of soil conservation, but incorporated soil conservation as part of the general agricultural services; the passing years have justified this attitude.

Contouring, diversion banks, and waterways can for the most part be constructed with unpretentious farm equipment, but technical and surveying advice and assistance are necessary for most farmers. The staff is inadequate to meet promptly all requests for advice and some works are being carried out independently. In only the more advanced stages of erosion is equipment outside the farm range required for remedial measures.

During the period under review a further 10,000 acres was protected mechanically under Departmental supervision whilst specific advice on agronomic (as distinct from mechanical) measures to prevent erosion was given in respect of a much greater area. Private contractors are tending to enter the field and six such contractors are now operating on the Darling Downs, using plans prepared by Departmental officers.

The agronomic measures now being applied to correct the early stages of erosion include rotation to pastures, protection by thicker sown pastures instead of thin native pastures, reducing the number of tillage operations, and leaving crop residues to act as a surface mulch instead of burning them. It is impossible to assess what adoption of these measures is now doing to conserve soil in Queensland, but certainly it is of very great, and growing, importance.

A very desirable and new approach to soil conservation schemes is now developing whereby communities of farmers band together on a watershed basis. Where a group of farmers occupy the watershed of a stream it is obvious that full efficiency cannot be attained by working independently; drainage, water disposal and diversion banks should be common, and co-ordinated not only between farmers but also with appropriate public authorities. During the year plans for group projects each involving several thousand acres have been drawn up for farmers in the Atherton, Booiie Road, Wooroolin, Memerambi, and Pittsworth areas.

SUGAR.

The 1953 season witnessed a sudden, though planned, rise in production, and sugar passed the million tons for the first time. The area harvested was 332,703 acres (274,757 in 1952), the tons of cane crushed was 8,751,063 (6,841,536) and the tons of 94 net titre sugar manufactured was 1,220,383 (934,614). New records were created in unit production, the yield of cane being 26.3 tons per acre and of sugar 3.67 tons per acre. Thus 7.19 tons of cane were required to manufacture one ton of sugar compared with 7.32 tons in 1952.

Although the 1952 crop had created a record the 1953 tonnage of sugar exceeded it by 30.5 per cent. The 1954 crop appears certain to create still another record and the present estimate is that 1,308,900 tons of 94 net titre sugar will be manufactured from nearly 9,500,000 tons of cane. The yield of cane per acre is expected to be about 1.5 tons below 1953.

Seasonal sugar prices realised were £47 18s. 6d. for home consumption sugar, £39 18s. for sugar sold to the United Kingdom at a price negotiated under the Commonwealth Sugar Agreement, and £31 3s. per ton for sugar sold on the preferential markets. The overall price was £42 7s. 11d. per ton compared with £42 12s. 3d. realised for 1952 sugar.

Early seasonal prospects for the 1955 season are good.

The Commonwealth Sugar Agreement, concluded in December, 1951, provided Australia with a market for 600,000 tons of sugar, of which 314,000 tons is to be sold to the United Kingdom at a price negotiated annually, whilst the remainder is sold at world parity plus U.K. or Canadian preference. These quotas have since been confirmed under the International Sugar Agreement signed in London last year.

With home consumption about 500,000 tons, it is obvious that the presently estimated 1954 production will exceed visible market requirements by about 200,000 tons. Some relief may be obtained by taking up shortfalls in other British Commonwealth sugar producing countries, but a big carry-over is inevitable. However, it is fully realised by industry leaders that if the market quotas are to be filled every year then a carry-over from good years is essential to eliminate deficits in poor years. Only by such action can the retention of quotas be justified and assured. It is expected that manufacture in the 1955 season will be limited to the aggregate of the mill "peaks" (1,170,900 tons), which approximates the visible market.

In 1951 the sugar industry was faced with the formidable task of increasing production by some 50 per cent.; it is a tribute to the industry's resourcefulness that this has been more than achieved in less than three years. A big programme of mill expansion was undertaken and the Central Sugar Cane Prices Board granted new and additional assignments to raise the cultivated acreage to the necessary levels.

It is true that production achievement has for the present overshoot the production goal. In this respect, however, three things should be borne in mind: Firstly, seasonal conditions for

the 1954 crop have been well above average. Secondly, the area under cane has been increased by some 35 per cent.; this is "new" land and so has a fertility level much higher than will be the case in four or five years time; yields will therefore be inflated for a time. Thirdly, in a period of rapid expansion the ratio of the higher yielding plant and first ratoon crops to the total crop is greater than normal; this also temporarily inflates yields. Accordingly, therefore, we must expect some settling down within the next three or four years.

The sugar industry is now a "£50 million industry" and has played a notable part in the development of the Australian tropics. It is second only to wheat in earning power of the cultivated crops of Australia.

CEREAL CROPS.

Wheat remains the leading grain crop in this as in other States. Although the winter seasons of 1953 and 1954 have been subnormal, nevertheless a crop of nearly 10 million bushels was harvested last year and a crop of 15 million bushels has been forecast for 1954. A discussion of the advances made in wheat husbandry will be found on page 33 of this report.

Late in 1953 the Commonwealth and the several State Governments legislated to continue the authority of the Australian Wheat Board for a further three years to enable the Commonwealth to participate in the International Wheat Agreement and also to provide for a guaranteed price for wheat sold in Australia. The I.W.A. provides for ceiling and floor prices of 18s. 3½d. and 13s. 10d. respectively in store at port. However, although these prices are satisfactory, the withdrawal of the United Kingdom, Italy, and Sweden from the Agreement, coupled with good crops and substantial carry-over overseas, has made the market sluggish and a large carry-over of Australian stocks seems certain. The current Agreement covers only 389 million bushels, compared with 581 bushels in the previous Agreement.

The State Governments, after prolonged discussion with the Commonwealth, agreed in July of this year to implement a stabilisation plan for five years, based on a guaranteed domestic price of 14s. per bushel f.o.r. ports, or the ruling I.W.A. price, whichever was the lesser, but provided the price shall not be lower than the ascertained cost of production. Provision is made in the plan for the payment of a premium of 3d. per bushel to Western Australian growers to offset freight advantages and also adjustment of the local price to bear the cost of freight to Tasmania.

Preparation for the bulk handling of wheat by the State Wheat Board is proceeding. Bulk stores are in course of erection at three centres on the Darling Downs, whilst plans for the bulk terminal at Pinkenba are in an advanced stage.

Barley has assumed additional economic importance with a crop of over 2 million bushels in 1952 and 1 million and an estimated 1 million bushels in 1953 and 1954 respectively. Maize production has declined in favour of grain sorghum production on less favoured lands and

now appears stabilised around 2½ million bushels. The area planted to grain sorghum fluctuates considerably and is influenced by the previous season's wheat plantings. This crop appears to be established around 2.5-3 million bushels.

The overseas market price trends have markedly affected the export sales prospects for these latter three grains. Between 1952-53 and 1953-54 maize fell from 13s. 9d. to 11s. per bushel, grain sorghum from £25 to £15 per ton, and barley from 17-18s. to 9-10s. per bushel. These lowered prices must be expected to influence trends in the pig and poultry industries and could (with benefit) influence farm practice by favouring some degree of rotation to other crops.

The Queensland cereal industries are fortunate in that they are for the most part based on fertile soils which have not, as yet, required the addition of fertilizer. However, this has led to some exploitation of the land and serious consideration must soon be given by cereal growers to the need for alternating cultivation with rotation to grass and animal production.

During the year there was established a Cereals Advisory Committee consisting of three industry representatives nominated by the Grain Growers' Association and two Departmental representatives. This Committee is now examining plans for investigating crop diversification and soil regenerative practices.

The production of the summer grains—maize and grain sorghum—is far below what might reasonably be assessed as a desirable level for domestic requirements. The beef, dairy, and pig industries, unlike those of other countries, use little grain; should we follow the American pattern then demand would increase several-fold.

TOBACCO.

The pendulum of tobacco sales has again swung: Following a good clearance at the 1951 sales with an average price of 105.2d., the 1952 sales finished with about a fifth of the crop unsold, while the average price for leaf sold dropped to 84.51d. This naturally depressed plantings and in 1952-53 the harvest dropped to 3,431,300 lb., compared with 4,666,699 lb. in 1951-52, while the average price of the 89.7 per cent. sold moved to an intermediate value of 102.99d. The 1953-54 crop is estimated to yield 4,350,000 lb.; to the end of June 1954 2,965,358 lb. had been offered and 2,759,287 lb. (or 94.26 per cent.) sold at an average price of 145.97d. per lb. Sales conducted since June 30th have attracted a somewhat lower figure but it is expected that 90 per cent. or more of the offerings will be sold at an average price of approximately 134d.

It is true that the quality of the leaf offered this year showed a distinct improvement: The season was generally favourable; the control of pests was better and the problem of undesirable spray residues was solved as a result of the development of a new insecticide; field husbandry showed some improvement; farmers' grading and packing were better; and the varietal position was improved.

However, all these factors combined were by no means wholly responsible for the record

price levels attained. Bidding at sales was unusually competitive, due no doubt in part to the participation of a new "big" buyer and also to the fact that the Commonwealth Government had announced increases in the statutory percentages of Australian leaf which must be incorporated in tobacco mixtures and cigarettes to attract concessions in import duties. One result of the high prices was the almost complete elimination of the small buyers from purchases. Thus it remains to be seen whether the high prices of the 1954 sales will be either lasting or prove advantageous in the long term.

There has undoubtedly been a feeling of enmity and suspicion between growers and manufacturers which has acted to the detriment of the tobacco industry. During the year a number of conferences have been held between growers, manufacturers, officers of the Commonwealth Department of Commerce and Agriculture, and officers of this Department. Although success has not yet attended efforts to devise a marketing stabilisation scheme, it does appear that general relations have improved. The major manufacturers have opened their factory grading floors to inspection by Government officers and the appraiser of the Tobacco Leaf Marketing Board and have also agreed to participate in the conduct of grading schools in the tobacco growing areas.

A cost of production survey has been carried out by the Commonwealth Bureau of Agricultural Economics and it is expected that this will assist the further projected discussions upon a stabilisation scheme. During the year, also, the Board was given the statutory power necessary to enable it to deal effectively with leaf submitted in badly graded and packed condition.

As a measure of encouragement to the Australian tobacco industry the Commonwealth Government in 1936 introduced a scheme for rebates of import duty on imported tobacco which was mixed with minimum percentages of Australian leaf. This rebate presently amounts to 1s. 6d. per lb. for leaf used in tobacco and 1s. 5d. in cigarettes. In view of the increasing production of tobacco this Department has long urged that these percentages should be increased if a stable industry were to be developed. It is gratifying to record that preceding this year's sales the Commonwealth Government announced that the minimum percentage in mixed tobacco would be increased from 10 per cent. to 12½ per cent. from July 1st, 1954; and from 6 per cent. to 7½ per cent. for cigarettes and from 12½ per cent. to 17½ per cent. for mixed tobacco, as from July 1st, 1955. This pre-announcement is an important feature inasmuch as it allows of the pre-purchase of leaf for maturation.

The manufacturers have submitted to the Commonwealth Government proposals for the contribution of funds from growers and manufacturers to match Commonwealth and State Government expenditure on research and extension services. Discussions on the manner in which these proposals can be implemented are now proceeding with the Australian Agricultural Council.

PASTURES.

Reference has been made in recent Annual Reports to the growing appreciation of the fact that grass is a crop and must be treated as such if satisfactory standards of nutrition are to be maintained in the animal industries. The increasing values of, and pressure for, land are influencing a change from extensive to intensive production and nowhere is this more evident than in the changed attitude towards pastures. Further details will be found in the subjoined reports of the Director of Plant Industry and the Director of Agriculture.

The establishment of an agrostological section in the Department was effected some five years ago. Although great difficulty has been experienced in recruiting and retaining trained staff, nevertheless marked progress has been made. The pasture demonstration trials have attracted wide attention and the requests for advice on pasture establishment have outstripped capacity to deal with them; the Director of Agriculture estimates that his field advisory staff spend more than 50 per cent. of their time on pastures.

Significant also is the decision of the Royal National Association to include an improved pasture competition in the Show catalogue and to provide an attractive prize schedule.

A very striking illustration of the effectiveness of the pasture drive is furnished by a recent survey of seed sales. Records submitted by leading seedsmen indicate that the sale of pasture plant seeds this season was more than three times that of the preceding season.

This expansion is even more remarkable when it is realised that supplies could not cope with the demand. There is as yet no commercial organisation for the collection of seed of buffel grass, molasses grass, phasey bean, and Townsville lucerne, so that supplies are inadequate and spasmodic. There can be little doubt that if circumstances permitted, the establishment of a Departmental seed collection section would be a great help in expanding the area under sown pastures.

The permanent pastures of southern Australia are based on the incorporation of clovers, mainly subterranean clover. The development of suitable legumes for pastures under summer rainfall conditions in sub-tropical and tropical Queensland presents special problems, but substantial progress is being made, particularly in coastal and sub-coastal areas.

A greatly expanded pasture research section of the Division of Plant Industry of the C.S.I.R.O. is now tackling Queensland pasture problems. In order to co-ordinate the work being done in this field of pasture research and extension there has been set up a Pasture Committee consisting of representatives of the C.S.I.R.O., the University, and this Department. By this means unnecessary overlapping is avoided.

There are currently in progress some 160 Departmental pasture trials and 80 pasture demonstrations extending from near Cape York to the border of New South Wales. The bulk of them are naturally in the dairying areas and

in the establishment of these, valued advisory and monetary assistance has been received from the dairying industry through the Dairy Pasture Improvement Committee.

The search for new and more adaptable pasture species is being pursued to the extent permitted by our resources and 40 species plots have been established; it is of interest to note that nine of these have been established on different soil types on far distant Cape York Peninsula.

Provided they are inoculated with their correct strain of nitrogen-fixing bacteria legumes can obtain their nitrogen supplies from the atmosphere instead of requiring the addition of expensive fertilizers. A pathologist has been detailed to carry out the work of isolating efficient strains for the inoculation of pasture plantings. Fertilizer trials are also being carried out in various parts of the State.

In the beef cattle areas the African buffel grass is showing great promise and is being widely planted; this is a case where expansion is severely restricted by the lack of adequate quantities of seed. Green panic, molasses grass, and the phasey bean are also assuming importance in the beef cattle country.

Associated with pasture work is some growing interest in grass hay conservation. Nowhere, and least of all in Australia, is pasture growth sufficiently regular throughout the year to permit full stocking. If waste is to be avoided grass must be mowed during the period of rapid growth and the hay so obtained used to supplement the grazing during the dry winter-spring period.

Late in 1952 the Department purchased two automatic hay balers to demonstrate bush hay conservation in pastoral areas. During the past season something over 30 pastoralists are known to have conserved grass hay and others have made silage; interest is growing and the economics of conservation should soon be tested, both as a drought insurance reserve and as a maintenance ration. As recorded elsewhere the annual seasonal loss of weight in beef cattle is a serious obstacle to quantity and quality of beef production. For the dairying industry more emphasis is being placed on the conservation of grass silage, a development made more practicable by an implement new to Australia, the buck rake.

Irrigated pastures do not constitute an important proportion of the pasture area of Queensland but their importance is rapidly growing. There is as yet no major gravitational irrigation scheme available for pasture lands, but farmers are making increasing use of individual pumping installations and, in a number of cases, "water harvesting" is being practised. Certainly the Department's irrigation advisory services are being taxed to the utmost.

The warmer climate of Queensland favours more rapid establishment of irrigated pastures and greater carrying capacities than are found in southern Australia. Full grazing within six months of sowing, and a sustained grazing rate of two mature cattle to the acre, appear likely to be normal practice. At the Regional

Experiment Station at Ayr 46 head of 2-year-old steers were depastured continuously on 25 acres, and mowing was necessary. Dairymen, especially wholemilk producers, are realising that even five acres of irrigated pasture, in conjunction with dry land grazing, can make a profound difference in milk yields.

THE ANIMAL INDUSTRIES.

Seasonal conditions were generally good for the pastoral industries but the dairying industry, after a dry winter in 1953, again experienced dry autumn and early winter conditions in 1954. The seasonal monsoonal rains commenced in January and caused heavy flooding in February, but thereafter ceased abruptly. This early short season resulted in pastures reaching their peak and declining in nutritive value relatively early in the season and consequently cattle have not passed through the winter in good condition.

As indicated in Table 1 the total numbers of cattle, sheep, and pigs each showed increases of approximately 5 per cent. over 1953 figures. Total meat production (a record) showed an increase of 3 per cent., wool sales showed an increase of 42,472 bales, or 8 per cent., and earned some £63½ million; on the other hand butter production declined by 15 per cent., cheese by 28 per cent., and total milk by 13 per cent.

Wool values have been generally well sustained under the open auction system. Domestic and export meat prices have remained at a level generally satisfactory to the producer. The war and post-war bulk purchase of meat by the United Kingdom Government ends on September 30th and sales revert to a trader to trader basis. In terms of the Meat Agreement current to 1967 the United Kingdom has guaranteed a minimum average price (to be negotiated annually), but it remains to be seen what influence will be exerted by trader to trader business. Moreover, it is important to note that the U.K. Government guarantee refers to wholesale prices in London and not to returns to the Australian producer.

The contract between the United Kingdom and Australian Governments for the purchase of Australia's exportable surplus of butter and cheese expires on June 30th, 1955, and the export trade will then presumably return to a fully competitive basis. Meanwhile open market price trends indicate a difficult time ahead. There was no change in the guaranteed local price of butter during the year; the Dairy Industry Investigation Committee found that the cost of production had increased by 1.72d. per lb. but recommended against the granting of an increased price on the grounds that it would build up consumer resistance.

Pigmeat production at 17,748 tons increased by 10 per cent. over 1952-53. The bulk purchase contract expires on September 30th and export sales prospects thereafter are not particularly good. Egg production increased by 8 per cent. The bulk purchase contracts with the United Kingdom Government terminated on May 31st, 1953 (eggs in shell) and May 31st, 1954 (egg pulp) and serious falls in export values were experienced instead of the anticipated rises. Returns for 16 lb. pack

dropped by more than 11d. per dozen, compared with 1952-53, and proved so serious that the Commonwealth Government has deemed it necessary to assist the poultry industry with a special grant of £250,000.

The activities of the Sheep and Wool Branch have been concentrated upon a reorientation of extension service methods and the development of the new fleece measurement laboratory service. The latter aims at the substitution, where practicable, of analysis or measurement for visual assessment in the selection and culling of breeding sheep. This service is rapidly being accepted and sought by studmasters and can be expected to speed up the rate of improvement of the Merino flocks. (A full discussion of this venture is given in the report of the Director of Sheep Husbandry.) Some success has also been achieved in initiating fodder conservation experiments and a number of properties conserved up to 10,000 bales of grass hay.

Research work, particularly on problems of infertility of rams and ewes, and mortality among lambs, were further studied on the Toorak Field Station with considerable success. These problems are of particular moment in the tropical zone where net reproduction rates are too low for culling and flock replacement.

Australian studmasters have achieved remarkable results in flock improvement down the years and it would appear that this success may have induced a certain amount of complacency. It is suggested that the time has arrived when consideration should be given to instituting a world search for particular genetic characters which could be incorporated in our flocks. For example, a higher fertility rate in sheep depastured in the tropics is obviously needed.

The Cattle Husbandry Branch is seeking to emphasise the importance and magnitude of seasonal fluctuation in nutrition by installing weighbridges at selected centres where regular weighings will be carried out. Fourteen such weighbridges have now been installed. Although this project is in its very early stages it is apparent that the general pattern of the cattle industry is that stock make a net gain in weight only during the four summer-autumn months. Around May they commence to lose weight as pastures deteriorate and they continue to lose weight for about four months; in the third four-months period they regain the weight they lost in the second four-months. Such a halting rate of progress is anything but satisfactory and the first problem is how to arrest the winter seasonal decline in weight; if that could be achieved beef production (and milk production) must rapidly increase.

Since the problem is one of nutrition it can be attacked in two ways—by improved pastures and the conservation of hay and silage. As indicated elsewhere some 160 pasture trials and 80 pasture demonstrations are in progress, whilst demonstrations of hay making are being carried out. Operating costs of grass hay conservation have been about 30 shillings per ton, with a yield of 15-25 cwt. of hay per acre.

Other research work in progress in the Cattle Husbandry Branch includes mineral deficiencies

diagnoses and correction, grazing habits of cattle, calf feeding, early fattening, and the important question of sterility in dairy cows.

The chief advance in the field of animal research has been the acquisition of a property at Rocklea close by the main laboratories of the Animal Research Institute at Yeerongpilly. When facilities have been developed this property will provide opportunity for research into many pressing problems of animal husbandry and nutrition. A herd of identical twin heifers now being assembled will speed up investigations since a test carried out with a single pair of identical twins is as reliable as one carried out with tens of the usual variable run of cattle.

The number of dairy cattle now under T.B. test increased by 120,000 to 520,000 and with one or two exceptions all important centres of population virtually have a T.B.-free milk supply. An important result of this T.B. eradication campaign is the fact that over 30 fully qualified veterinary practitioners are now resident in rural areas and available for consultation by farmers and pastoralists.

A particular effort is being made to obtain more effective control of the bovine disease contagious pleuro-pneumonia. This disease is enzootic in the north-western and Northern Territory breeding areas and, quite apart from its direct effect on the well-being of the cattle, restrictive measures on the movement of stock have been imposed by Victoria and New South Wales. Fully effective control is impossible in the present state of poor subdivision of the large runs but immediate contact is being made with the owners of all diseased stock slaughtered at abattoirs, two special extension officers have been appointed in the north-west, and a renewed laboratory study is being made of methods of diagnosing the disease in its quiescent condition.

Problems of more effective disease control, mineral deficiencies, sterility, mineral poisons, and plant poisons, have been studied in the research laboratories, while a great deal of time has been devoted to the study and testing of the new insecticides which the chemists turn out at an unabated rate.

The cattle tick remains the chief problem and is to be the subject of a special overseas visit by the Director of Animal Industry. Upon his return it is proposed to intensify the research work on this important pest. The development of a race of ticks resistant to arsenic has long been known and resistance to BHC has been observed in certain areas; so far there has been no evidence of acquired resistance to DDT but this must of course always be regarded as a possibility. Consequently the testing of all available new insecticides must go on.

The decline in price of coarse grains makes them cheaper to buy than wheat and demonstrations have been carried out to show how sorghum and maize can be substituted for wheat by poultry farmers. These results have been passed on to the industry. The relative productivity of pure poultry breeds and cross breeds is being tested, antibiotics are being thoroughly tested and a special study of poultry diseases is being made. A high percentage of deaths among laying hens is regarded as "normal" in the industry and is undoubtedly an important

factor in lifting costs of production. Problems of nutrition and general health can now be studied in the new poultry section at Rocklea.

A piggery section has been established at the Hermitage Regional Experiment Station near Warwick, and a Berkshire herd is being assembled. This piggery will not be run in association with a dairy herd and *inter alia* will serve to explore the economics of pig raising on a grazing-grain basis on the Darling Downs.

MISCELLANEOUS.

The following miscellaneous items of action or achievements are worthy of record:—

The building of the first Local Abattoir (at Toowoomba) is now almost accomplished. Tenders have been called for the erection of local abattoirs at Ipswich and Bundaberg, whilst sites have been selected and plans are in course of preparation for abattoirs at Rockhampton, Mackay, and Townsville. The provision of such facilities will make for a much more hygienic treatment of meat, permit better inspection, facilitate grading if required, and also promote better utilisation of by-products.

Following its unsatisfactory operation for some time, and lack of sufficient support from producers, the Government decided not to extend the life of the Potato Marketing Board and it went out of existence on March 31st, 1954. The Arrowroot Marketing Board, the first commodity to be set up under The Primary Products Pools Act in 1922 was also wound up; the big decline in arrowroot production and lack of support by producers were the determining factors.

A staff of inspectors is maintained in the Brisbane market in order to check the condition of fruit and vegetables offering for sale; suitable standards of size, maturity, and packing have been prescribed. It is apparent that at least some of the shortcomings of market presentation are due to ignorance and consequently a market advisory service was instituted during the year. Field officers receive copies of infringement notices weekly and are thus enabled to contact and advise such of their growers as do not pack or handle their produce efficiently. Something of a "racket" started to develop in the orchard mail order trade, windfalls and under-sized fruit being despatched direct to the purchaser and so escaping markets inspection. Rail inspections of this fruit were instituted and heavy condemnations have improved the position.

The mitigation of frost damage in pineapple fields is being explored. A number of possible methods of coping with this problem are being tested, including a "wind machine"—a propeller, revolving at high speed, which mixes the air and so eliminates cold spots.

An interesting analysis of the "Honorary Correspondent" system of forecasting crop yields and trends will be found in the report of the Marketing Branch. This service was instituted in 1946 and the first crop report (on potatoes) made in 1947. During the year under review 24 crop reports were issued on the basis of information collected from 736 correspondents, some of whom report on more than one crop. A total of 21,549 copies of these 24 reports was mailed to interested persons, commercial

organisations, and statistical centres. In the light of the experience gained it is becoming possible to improve the reports and attain even greater accuracy than in the past.

With the assistance from the industry two new district dairy research laboratories were opened during the year—at Murgon and Malanda. A total of £178,000 was expended in the installation of new approved equipment in butter factories and £35,000 on new equipment for cheese factories. In the continuous supervision designed to ensure the purity of fresh milk supplies a total of more than 330,000 tests was carried out by the Dairy Research Laboratory and its branch laboratories.

The increasing use of reconstituted milk overseas prompted the carrying out of experiments in the reconstitution of milk from locally produced skim-milk powder and butter oil. Using high-quality products a palatable product has been produced. Reconstituted milk, locally prepared and pasteurised, may well be the answer to the milk supply problem of the far west.

An interesting example of an emergency plant breeding job is furnished by the bean industry. In 1949 there appeared a new rust disease which was particularly severe on the variety Brown Beauty which constituted practically the entire bean crop of Queensland. Testing and search revealed that a variety of navy bean (Californian Small White) and two French beans (Florida Belle and Landreth) were highly resistant. New types of Brown Beauty incorporating the rust resistance of these three beans are now well on the way to development.

STAFF.

The staff position remains difficult due to the small number of students graduating from the University and to intense competition for graduates. Recruitment from the Queensland Agricultural College was again disappointingly low, only 4 of last year's diplomates seeking positions in this Department.

Eight graduates resigned during the year and two accepted other positions before taking up their appointment; a further six have resigned since June 30th. One Branch head, Mr. R. A. Paul, Director of Field Services in the Division of Dairying, resigned to accept a position in Tasmania; he has been succeeded by Mr. F. C. Coleman. The Government Botanist, Mr. W. D. Francis, retired under age limit provisions on June 30th, and has been succeeded by Mr. S. L. Everist. Mr. D. O. Atherton, Director of Agriculture, relinquished his position to take up the re-created position of Director of Tropical Agriculture with headquarters at South Johnstone, near Innisfail. He has been succeeded by Mr. W. J. S. Sloan.

Mr. A. L. Clay, Assistant Director of the Division of Animal Industry, and Mr. L. E. Nichols, Director of Dairy Research, returned from overseas after having represented the Commonwealth at international conferences. Messrs. W. Webster, Director of the Division of Animal Industry, H. S. Hunter, Director of Marketing, and F. N. J. Milne, Husbandry Officer, are at present abroad. Mr. V. H. J. Caley, who had been awarded a Dairy Training Scholarship in the University of New Zealand,

took up duty after specialising in market milk production, processing, and marketing. The services of Mr. D. J. McKerrow, Senior Adviser in Sheep Husbandry, have been made available to the Pakistan Government for a year; he will establish a sheep experiment station in the Thal Valley.

A new development has been the appointment of an Agricultural Engineer to advise farmers and extension officers on agricultural engineering problems and also to act in liaison with machinery manufacturers.

We have long felt the necessity for instituting a system of training in extension methods for field officers. No such course is available anywhere in Australia and the provision of training has perforce had to wait on the establishment of our own training nucleus. Using funds from the Commonwealth Extension Services Grant, a small extension consultant and training unit has been established under the leadership of Mr. G. R. Moule, who visited the United States in 1952 under a "Leader and Specialist" grant from the United States Government. An

exploratory training school was conducted during the year and will now be a regular feature. The unit will also gradually proceed to plan Branch extension methods and drives.

ACKNOWLEDGMENTS.

The Department gratefully acknowledges much assistance and many courtesies received from Commonwealth and State Departments and Boards, the C.S.I.R.O., the University, primary producers' organisations and individual primary producers, manufacturers and distributors, press, radio, and the small army of Honorary Crop Correspondents.

Yours faithfully,



Under Secretary.

20th September, 1954.

DIVISIONAL DIRECTORS' SUMMARIES.

DIVISION OF PLANT INDUSTRY.

Director—Dr. W. A. T. Summerville.



Dr. W. A. T.
Summerville

Those not skilled in the subject are apt to talk and think in over-simplified terms of things agricultural, but in modern times there is very little that is really simple in primary production. To be successful a farmer has to consider in some detail his soil and its structure, the machinery needed to prepare his fields for sowing, the amount and kind of fertilizer required, the range of varieties to suit his soil and the prevailing climatic conditions, the methods, both chemical and mechanical, required to control his weeds, his harvesting machinery, the control of the pests and diseases which may take toll at any time from purchase of the seed to the final disposal of his product, and finally the sale of the product.

The list could be lengthened considerably, and in many crops the complexity of considerations is even greater. Generally speaking, the smaller the area the more intensive the farming and the more intricate the problems. Such complexity naturally has its reflection in the work of the agricultural scientist, whose task it is to assist the farmer in the solution of his problems.

The solution of any complex problem demands that in the first place it be broken up into its component parts and each component attacked along lines calculated to offer the greatest promise of progress towards the desired immediate end. Finally, the ends must be tied together to establish balance in the whole farming programme.

In practice this means that the more complex the problems of the farmer the more specialised must the required scientists be. This has attendant risks in two directions. The first is that the specialist may lack the breadth of outlook needed for an accurate diagnosis in industry terms; the other that he may not give sufficient weight to some aspects which influence the implementation of remedial measures. In other words, there is always the risk of solving one problem and thereby creating another.

Nevertheless, specialisation of science is inseparable from efficiency, and other means must be taken to ensure that the final tying up of ends does take place. Experience within the Department strongly supports the view that there is no surer way of accomplishing this than by meeting industry representatives regularly in conference. It is therefore most pleasing to report that not only has the Division for some time enjoyed the active help of several industries, but that the activity of co-operating bodies has increased and new ones are coming into being.

It would seem desirable now to give some account of these close liaisons both as a record of appreciation of the confidence placed by those industries in scientific services and in the hope that others may be stimulated to similar action. In the first place it may be recorded that the approaches have come from both sides, the co-operation of the Division being sought by primary producers in some instances, whilst in others first advances were made by the Department.

In opening such an account, the highly successful co-operation between industry and the Department in the development of the Bureau of Sugar Experiment Stations immediately comes to mind.

Probably the longest standing and best known current example of co-operation is that with the Committee of Direction of Fruit Marketing and its component Sectional Groups. The Pineapple Sectional Group has for many years worked in close co-operation and has provided both money and facilities for special projects. Recently, for example, that body provided finance for an officer of the Division to visit Hawaii to enquire into a number of aspects of pineapple growing.

The Banana, Vegetable, Deciduous, and Other Fruits Sectional Groups have all been co-operative, and officers of the Division frequently attend meetings of each of these bodies to learn at first hand from representative growers what problems of production are causing concern, to discuss these, to offer suggestions, and to formulate plans aimed at their solution. Many successful field days have had their origins in such meetings. Another result of the close liaison is the supply, every week, of advisory articles for publishing in the official journal of the C.O.D.

Another co-operative body of long standing is the Dairy Pasture Improvement Committee. For several years now this Committee has given a helping hand in some of the most successful pasture investigations in this State. Nor has the assistance from the industry been wholly advisory, since each year, through the good offices of its representatives, the industry has provided some finance for particular projects. This finance has a bearing quite out of proportion to its by no means inconsiderable size, since it has been a sure indication of real interest in the work and consequently a stimulus to all concerned. In passing, a tribute must be paid to Mr. C. H. Jamieson, President of the Queensland Dairymen's Organisation, who, until his retirement this year, was a member of the Committee from its inception. He was always most helpful.

More recently, in the pasture improvement work, close links have been forged with the grazing industry through the formation of the

Australian Beef Cattle Research Committee and in particular, insofar as the Division is concerned, its subsidiary "Brian Pastures" Technical Committee. The Australian Meat Board, by the provision of funds for the purchase and stocking of suitable properties, has been largely responsible for the initiation of some of the most important work so far undertaken in Queensland for the beef cattle industry. It may be safely said that, having reference to husbandry problems, at no previous time have the points of view of the Department and the grazier and the C.S.I.R.O. been better understood by each of these parties so interested in the advancement of animal husbandry practices.

As an adjunct to this Research Committee, Divisional representation on the Animal Industry Committee of the United Graziers' Association has helped in no small measure in ensuring both a close liaison and a better understanding of common problems, and approaches to these problems, by the men engaged in the industries and our own officers.

Insofar as the Division is concerned this contact with the grazier is essentially concerned with pastures, and it is therefore well to record also that a Queensland Pasture Liaison Committee is a well established and functioning body. This Committee is a purely scientific one with representatives of the University, C.S.I.R.O., and the Department as members. Additionally, the fact that the Burdekin Pasture Committee is composed of another section of C.S.I.R.O. and Divisional officers further ensures close collaboration on such work.

The Improved Pasture Competition now being conducted by the Royal National Association, with close co-operation from the Department, is something of a consummation of all these efforts. A few years ago such a competition would have been a fiasco—all indications at present are that it will be a most gratifying success.

The most recent addition to the list of convened co-operating bodies is the Cereals Advisory Committee, representative of the Department and the grain growers. This body is now engaged in reviewing current work, and whilst it has not been sufficiently long in existence to have initiated positive action, there is every indication that it will achieve its essential purpose of linking growers and Departmental officers to their mutual benefit.

Nor is co-operation confined to the more directly primary industries, for whilst no formal liaison committees exist there is close relationship between the Division and firms interested in the manufacture of machinery and chemicals. Liaison with the former ensures that our officers are kept thoroughly up-to-date with the latest developments in mechanical implements, and the firms in their turn are in a somewhat better position to know in advance the probable special requirements of the farmer in this State. All of this must react to the benefit of the farmer. The inclusion of machinery demonstrations in Departmental field day programmes is one result of such co-operation, whilst the attendance of our officers at special schools of machinery instruction is another. Both have been found most valuable.

On the chemical side, for many years the major fertilizer firms operating in this State have worked well with the Department. More recently an example of co-operation on a generous scale has been given in connection with the large-scale experiments for brigalow eradication. Without such help the Department could not have been nearly so far advanced with this very important work as is now the case.

No endeavour has been made to cover completely the whole field of close co-operators, as this would involve a lengthy account embracing bread manufacturers, flour millers, Queensland Acclimatisation Society, tobacco firms, the University, Department of Public Instruction, Departments of Agriculture in other States, and several divisions of C.S.I.R.O. amongst others. Lastly, the close liaison, with other Divisions of the Department and the interlocking interest of the several branches of the Division itself would figure largely in any full account.

The essential point which it is desired to bring to notice is that though specialisation by individual officers is inescapable, there is a clear recognition of the complexity in all branches of primary production, and every effort is being made to ensure that in all Divisional work both "the woods and the trees" are clearly seen.

STAFF.

Due essentially to the lack of suitably trained men throughout Australia, difficulties are still being experienced in obtaining and retaining scientific staff. During the period under review six graduate officers were lost through resignation, and recruitments to the permanent staff numbered nine, but as usual the new officers were, with one exception, freshly trained men who inevitably need to gain experience before their training can be capitalised by the Department.

Two major staff adjustments were made, both arising out of experience with the organisation as laid down in 1945. The more far-reaching of these was the creation of the position of Director of Tropical Agriculture, to which Mr. D. O. Atherton was subsequently assigned. The reason for this step lay mainly in the increase in problems and staff in northern parts and particularly in the Burdekin and Mareeba-Dimbulah irrigation districts. Some 45 officers of the Division are now stationed from Mackay northwards. Climatic differences are quickly reflected in agriculture, and it was found increasingly difficult to direct efficiently from Brisbane the work in this rather unique territory. It is expected that the stationing in the north of a well trained officer with long experience in both science and administration will materially increase efficiency. Mr. Atherton's former position of Director of Agriculture was filled by the promotion of Mr. W. J. S. Sloan.

The other major change was made in the Science Branch, which embraces the fields of entomology, plant pathology, and botany. Increases in status were accorded several officers, and the three sections were made administratively independent and with direct attachment to the Director of the Division.



Plate 1.

MOLASSES GRASS REPLACING BRACKEN FERN AT COOROY.



Plate 2.

IRRIGATED PASTURE ON A RELATIVELY INFERTILE SOIL AT CABOOLTURE.



Plate 3.

BUFFEL GRASS IN FOREGROUND AND GREEN PANIC IN THE BACKGROUND, AT DULULU, DAWSON VALLEY.



Plate 4.

CONTOUR BANKS ON FALLOW LAND ON A BUNDABERG DISTRICT SUGAR-CANE FARM.



Plate 5.

A PROMISING CROP OF ALPHA GRAIN SORGHUM, GULF EXPLORATORY FARM. SWEET SORGHUM IN BACKGROUND.



Plate 6.

A GOOD CROP OF CRISTAUO COWPEA ON THE GULF EXPLORATORY FARM.

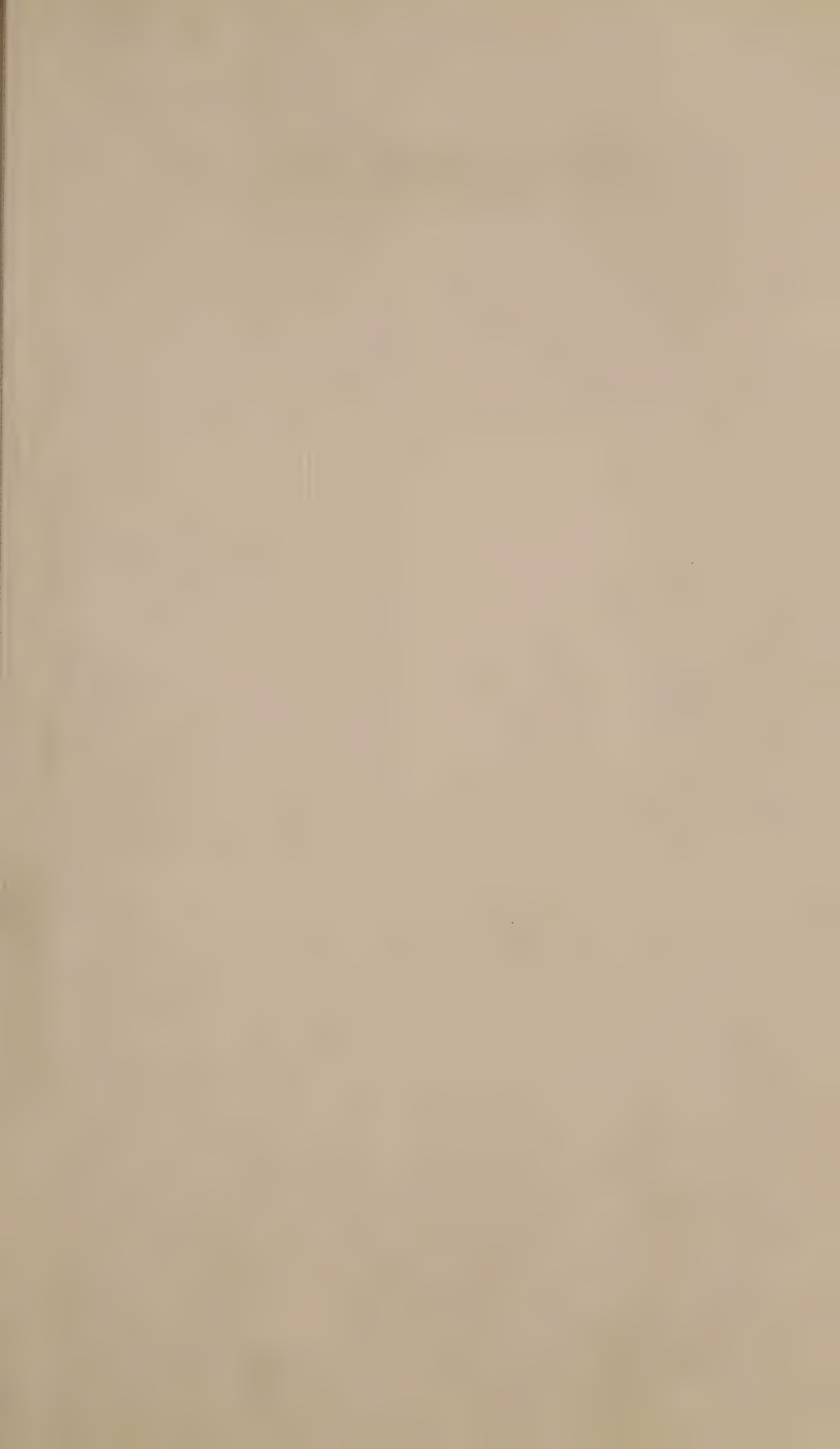




Plate 7.
GRAIN SORGHUM ON THE PLANT BREEDING LEASE AT
KINGAROY.



Plate 8.
A NEW TOBACCO FARM IN THE BUNDABERG DISTRICT.
THE OLD STALKS HAVE BEEN PULLED AND HEAPED FOR
BURNING.



Plate 9.
BULK HANDLING EQUIPMENT FOR WHEAT ON A
MT. TYSON FARM.

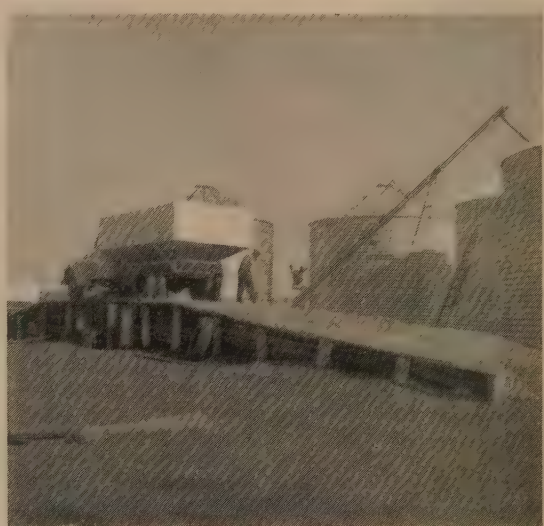


Plate 10.
BULK STORAGE FOR GRAIN ON A DARLING DOWNS FARM.



Plate 11.
PASTURE FURROWS IN THE CROWS NEST DISTRICT.

The appointment of a machinery adviser makes a forward step in services to the primary producer and is further recognition of the growing importance of mechanisation in agriculture. It is hoped to expand this particular section in due course.

At the end of the year the services of Mr. W. D. Francis, Government Botanist, were lost, upon his retirement under age provisions. Mr. Francis has given highly efficient and most unobtrusive service for some 35 years. He gained international reputation as an authority on rain forest (scrub) trees, in which he specialised, and made many important contributions to the knowledge of valuable timber resources.

In addition to normal staff, seven temporary officers were recruited for special duties under the Commonwealth Extension Services Grant, and one such officer terminated his appointment during the year, making a total of 13 such appointees now employed.

Whilst the unavoidable vacancies in staff cause some difficulties, there has been no diminution in the volume of work handled and a full programme of investigational and advisory services has been maintained, as will be seen by perusal of the attached reports from the heads of branches.

SPECIAL INVESTIGATIONS.

Brigalow Eradication Work.

That several millions of acres, probably not less than 13 millions of some of the best agricultural and pastoral soils in the State, are still covered by unproductive brigalow scrub is a challenge which must be answered if the reasonable development of Queensland is to proceed. The development of this land, much of it enjoying a climate which would permit agriculture and much excellent grazing, is costly and slow by the older manual methods. The bulldozer and other mechanical means have been effectively used in comparatively small areas, but mere removal of the aboveground portions of the tree is of very limited value. Sucker regrowth must be controlled. Whilst this can be done under special circumstances, such as where sheep can be depastured, this is limited in many cases by lack of surface water supplies. Chemical control, especially if rapid spread of material can be achieved as by aeroplane, is therefore most appealing.

Departmental botanists have for the past three years conducted experiments with a number of chemicals of the plant hormone type. All the evidence so far obtained points to success, but a final verdict must be deferred until it has been demonstrated that regrowth of suckers does not follow treatment.

Pasture Investigations.

The report of the Agriculture Branch includes a comprehensive account of pasture work and good progress is evident.

A feature of pasture improvement work which is a cause for considerable satisfaction is the increase of interest and of practice by graziers. Dairy pastures have, rather naturally, received first attention, but in recent years worthwhile developments have occurred in the main beef fattening country. It must be admitted that the problems in these parts are more difficult and results more slowly obtained. Nevertheless, progress is being made, and with grasses such as Rhodes, green panic and buffel, and legumes like *Phaseolus* and Townsville lucerne, much advance can be expected in parts now given over exclusively to black spear grass and transient native legumes.

As has been inferred, there is still much to be learned, and it is hoped that "Brian Pastures" Research Station will provide many of the answers.

Pest and Disease Control.

As recorded by the Chief Entomologist in his report, there was only one outbreak of insects in plague proportions during the year. This pest, the *Prodenia* caterpillar, caused heavy loss of pastures in several coastal areas but was not a major trouble over any large area.

A wide range of pests and diseases, touching almost every crop of importance in the State, is under investigation and satisfactory results have been achieved. The stationing of entomologists and plant pathologists at strategic points throughout the main producing areas has proved most valuable in this work.

The outstanding single achievement has been in the fight against tobacco pests. The painstaking and thorough work which has been a feature of the efforts of both entomologists and chemists during the past two years has met with success, and the general position with respect to pest control recommendations is felt now to be more satisfactory than at any previous time.

The somewhat bewilderingly rapid release of new pesticides continues. The consequent pressure on toxicologists and entomologists is causing concern and may force a change in policy in the handling of new materials. It is evident that no reasonably sized staff could handle all such. There is one point, however, on which no change of attitude can be contemplated, and this is that human health is the prime consideration, a point that is sometimes overlooked by enthusiastic protagonists of individual materials.

Chemical Investigations.

The chemical laboratory has covered the usual wide field of investigation and services. The development of country laboratories has proceeded this year, Mareeba being added. So far the primary consideration in opening up these centres at Ayr, Atherton, and Mareeba has been to accelerate soil survey work. As pressure for this type of work eases it is intended that other aspects, including biochemistry, will be given

further attention. Biochemical work so frequently calls for the prompt handling of material in the laboratory that the position can be satisfactory only when laboratories are functioning adjacent to the areas in which the problems are being investigated.

Attention might be directed in particular to the successful conclusion of the fluoride toxicity investigations. Pastoralists now have in their hands the weapons to overcome this trouble.

Of the other biochemical aspects under investigation, that dealing with copper requirements, intake and usage by grazing animals is of special interest. The problem is intricate but the goal is undoubtedly worthwhile and is perhaps in sight. Both the well-being of the animal and the quality of the milk are involved.

Australia is recognised as being in the forefront of investigations into trace elements and Queensland is taking all practicable advantage of the leadership. Whilst the State as a whole possesses soils appreciably above average, that is not to be construed as meaning that problems in soil fertility are unimportant. Although soils like those of the Darling Downs are capable of producing high yields without the addition of standard fertilizers, even these highly fertile tracts may benefit from the application of some soil amendment. Whilst such soils may contain sufficient of all essential plant nutrients to ensure no diminution in growth and yield, there is always the question of rate of availability of each particular element. Where rate of supply of an element which contributes only to quality is a limiting factor, the more grain produced the less of the short supply nutrient it will contain. The key to the problem of mottled wheat may lie along such an avenue, particularly as some of our most productive varieties are the most severely affected. Quality of product must be considered along with quantity.

At the other end perhaps of the fertility scale we have a proportion of the wallum soils. Chemical examination suggests that these soils are deficient in several essential plant nutrients, and extensive field experiments are in progress to investigate further this potentially valuable area containing some three million acres of well situated land with adequate and reliable rainfall. As will be seen from the reports by the Agricultural Chemist and the Pathology Section, both chemical and microbiological aspects are being examined.

Field Crops.

The report by the Director of Agriculture discloses that a comprehensive programme of work has been prosecuted covering virtually every field crop which the State can produce. On the investigational side major projects being handled by the Agriculture Branch deal with 25 crops. General agronomy, plant breeding, fertilizing, varietal testing, and general cultural problems are each receiving attention.

The success of Spica wheat and Bovah oats, the two most recent releases by Departmental plant breeders, is particularly gratifying.

Of no less importance than the investigational work is that concerned with taking the results to the farmers. That there has been an improvement in the general farming standard in the State is generally conceded, and it is felt that the extension workers of the production branches can justly take some share of the credit for this.

Planting material is the basis of any crop, and one factor contributing to the uplift in the standard of farming in Queensland is the use of better seed. For some years the Department has been making strenuous efforts to improve seed quality, and the seed certification scheme, the product of sound biological work and legislation, is proving its worth. The willingness with which growers pay premium prices for certified seed is testimony to both the success of the scheme and farmers' assessment of the importance of good seed.

Soil conservation continues as a major activity. In addition to the help given to individual farmers as previously, this year saw the introduction of whole-catchment planning. In a large number of cases single farm protection work, important though it is to the individual, is often scarcely better than a palliative in the national sense. Catchment planning enables more efficient work on many farms, and additionally makes the protection of streams and public utilities more practicable. It is hoped and expected that this type of work will be extended.

Fruit and Vegetable Crops.

Three Branches of the Division give constant attention to fruit and vegetable crops, and major investigations are in progress on some 15 species or groups of species. Entomology, pathology, plant breeding, plant nutrition, and general horticultural practice angles are each strongly represented.

Perhaps the most important aspects to which attention might be called are induction of fruiting, weed control, and disease control in pineapples, pest control and bud selection in citrus, fruit fly studies in a wide variety of fruits, varietal testing in all major vegetable crops, plant breeding in tomato and beans, and comprehensive series of experiments in preservation of fruits.

The successful work on waxing of bananas to preserve the marketed fruit could have highly significant benefits for the producers and buying public alike.

Regional Experiment Stations.

In many respects the work of Regional Experiment Stations represents the consummation of the investigations of much of the Division. On these properties the more restricted results of the specialist are gathered together and incorporated into an overall farming venture.

Crop specialisation has for a long time been a feature of much of Queensland's agriculture. Kingaroy for years was virtually synonymous



Plate 12.

WAXING OF THE FRUIT AT THE BOTTOM
HAS KEPT THEM IN GOOD CONDITION.



Plate 13.

SMALL CROPS AT REDLANDS EXPERIMENT STATION.



Plate 14.

PORTION OF THE ATTENDANCE AT A FIELD DAY ON
BILOELA REGIONAL EXPERIMENT STATION.



Plate 15.

A SEED PRODUCTION AREA OF MUNG BEAN AT BILOELA
REGIONAL EXPERIMENT STATION.



Plate 16.

EXPERIMENTAL SPRAYING OF PEACHES FOR FRUIT FLY
CONTROL.



Plate 17.

THE TYPE OF WHITE GRUB, 1½-2 IN. LONG, WHICH
DAMAGES PASTURES IN QUEENSLAND.

with maize and peanuts, the Darling Downs meant wheat, the Lockyer potatoes or lucerne, and so on. It is natural and right that the farmer and the district will favour the crop which gives the best returns, but there must be a greater realisation that monoculture can be exploitation and exploitation is inevitably the forerunner of deterioration.

The work of Regional Experiment Stations is of particular importance in that it seeks to find not only what crops and varieties of each are suited to the region the station serves, but also what sequence of cropping and farm operations is required for these crops, as well as to preserve or improve the soil.

Crop rotation is thus a feature of regional station work, and as sound rotational farming usually calls for the incorporation of a pasture

phase in the cycle, the grazing animal is brought into the compass of the work as far as is practicable and desirable. This in turn provides facilities on the stations for long-term investigations on the part of the Division of Animal Industry and the Division of Dairying.

Whilst farming practice is kept to the forefront in planning the work of the stations, it is still possible for the most part to superimpose a large amount of somewhat more restricted research on the basic plan. Thus if the rotation at Hermitage calls for planting wheat on a particular field, that field and wheat can be used by the plant breeder or the agronomist or the soil conservationist. The stations thus fulfil a dual purpose, and indeed the secondary purpose would often be impossible of attainment with efficiency other than in such completely controlled conditions.

DIVISION OF ANIMAL INDUSTRY.

Director: Mr. W. Webster.



Mr. W. Webster.

The past year has been notable generally for continued expansion of the work of the Division of Animal Industry, but particularly for the consolidation of existing forces and increasing collaboration with the other Divisions of the Department as well as with the leaders of the animal industries.

Whilst a brilliant individualist may do outstanding work, his scope is limited. It is now accepted throughout the world that in both research and extension, many important problems are so complex that best results can only be obtained from a number of people, each a specialist in his own field, working together as a team.

Since the reorganisation of the Department of Agriculture and Stock into Divisions, the Division of Animal Industry has been going through a rather formative period in developing team-work within its own organisation. Whilst this development is not by any means complete, there is general acceptance of the principle and such team-work is improving. What is now evident is the need for continued collaboration with specialists in other Divisions. Extension and demonstration work under the Commonwealth Extension Services and Dairy Extension Grants have been undertaken largely as a co-operative effort by the Divisions of Animal Industry, Plant Industry and Dairying. This co-operation has been real, for an active committee of the three Divisional Directors and a sub-committee of three senior officers has directed the work, whilst officers from each division have been seconded to work full-time as a team carrying out general supervision. Field staff from each Division have undertaken the local supervision in country districts.

Within the Division small research committees are being formed to plan research work and examine the results. The first of these, the Poultry Research Committee, has been working for some time and has more than justified its existence. This committee is composed of the Assistant Director of the Division, as chairman, and representatives of the poultry extension and research staffs. The composition of the committee enables the research staff to become acquainted with the problems of the industry and the extension staff to assist in the examination of results of research and transmit them to the industry.

Additional research committees are being formed to assist in planning and evaluating research work for the other animal industries.

Fodder conservation is important in all districts of the State, but particularly in those where the long dry winter causes an annual

loss of production, lengthens the period of development of stock and interferes with reproduction. Modern machinery may provide the means of making conservation more economic. A small committee made up of representatives from the Plant Industry and Animal Industry Divisions is charged with investigating problems of fodder conservation.

Mineral deficiencies exist throughout a large part of Queensland and affect the production of the animal industries in these areas. Whilst some of these deficiencies are straightforward and become only a problem of the cost of supplying the required supplement, there are others which are much more complex. Active teams of workers are at present investigating these problems; they are drawn from the Sheep and Cattle Husbandry Branches and the Husbandry Section of the Research Branch. In this work, they receive valuable co-operation from the Agricultural Chemist's staff.

With the knowledge that there should be goodwill between the Department and the animal industries, and because in addition the Department is at all times anxious to obtain advice from the industry of its problems, advisory committees have been formed to assist the Minister in this way. Prominent among these is the Pastoral Advisory Committee, which works under the chairmanship of the Minister and has for Departmental representatives the Under Secretary and the Director of the Division of Animal Industry. The pastoral industries are represented by two members from the sheep industry and two from the cattle industry. This committee can do much useful work. Whilst meetings up to the present have been concerned largely with the examination of work of the Division, there has been already tangible evidence of the desire for understanding by the industry representatives of the problems associated with research, extension and disease control.

The Poultry Advisory Board, working under the chairmanship of the Minister and composed of representatives of the Department, the Egg Marketing Board and a poultry industry organisation, has been functioning for some years. It has shown also that collaboration between the industry and the Department of Agriculture and Stock can be to the benefit of both organisations and assist in increasing the efficiency of production.

An example of how both these committees have been prepared to give practical assistance in solving the problems of their industries and obtain the advantage of the work in animal disease and husbandry problems can be seen in the projected visits overseas of the Director of the Division and a Husbandry Officer of the Poultry Branch. Both are going at the suggestion of the two industries concerned and these have contributed a substantial proportion of the cost of the visits.

The financial assistance given through the Commonwealth Extension Services and Dairy Extension Grants has helped to accelerate existing work of the Division, and the initiation of new projects. The assistance has been timely, for the animal industries are at the stage when changing marketing conditions indicate the need for higher quality products, particularly in the beef industry, and necessitate greater efficiency in production of the well established lines.

Work made possible by grants from the Wool Funds controlled by a Commonwealth inter-departmental committee has given staff the opportunity of investigating husbandry and disease problems causing decreased production in the sheep industry. These funds have been used wisely and dividends are now being shown. Infertility, low lambing rates and lamb mortality are the most serious problems of sheep production in northern Queensland. It can now be said that solution of these problems is practicable but much demonstration and extension work remains to be carried out.

On Brian Pastures, the property made available by the Australian Meat Board, research and investigational work is being carried out by the Department on its own account, and also in co-operation with the C.S.I.R.O. The property is already stocked and basic data on growth rates as well as grazing habits and pasture palatability are being collected by officers of this Division.

SEASONAL EFFECTS.

With the exception of only a few districts, the 1953-54 season has been good throughout Queensland. Rather more rain than was required fell in most of the eastern parts of the State, causing local flooding and some damage. Rainfall was insufficient on the Darling Downs, particularly in the southern and western sections of the area. The far north-western corner of the State, particularly the Barkly Tablelands, was also exceptionally dry.

Chiefly as a result of seasonal conditions, there was good production from the beef, dairy, sheep, pig and poultry industries, that from the beef industry being higher than usual. There was, however, a reduced turn-off of cattle in the North-west and only a trickle of stores came from the Northern Territory. A partial failure of the grain sorghum crops on the western Darling Downs was experienced and wheat plantings as at June 30 were far below normal, insufficient rain having fallen. The turn-off of fat cattle and lambs from the Downs area has been reduced.

There seems to be a tendency to decentralise the sale and slaughter of beef cattle, due to the inability of the southern meatworks to handle all available cattle.

Sheep numbers are increasing slowly and a corresponding increase in wool marketed is expected. This is further assisted by successful spring and autumn lambings and no serious blowfly activity.

Production figures to March in the pig industry indicate an increase for 1953-54 as a whole, which is no doubt due in some measure to the cheaper price of grain.

For the first time for some years, there appears to be a small increase in egg production, due to increased hatchings during the year. Although sexing of 2,699,857 chickens is a record and exceeds by more than three-quarters of a million the number for the previous year, it must be remembered however that owing to the uncertainty of the future of the industry at the time, the number of chickens hatched in that year was unusually low.

CHANGES IN LIVESTOCK PRODUCTION.

In planning research and extension work, an endeavour is made to determine just what are the problems of the animal industries. Work is then carried out in relation to those problems as far as finance and man-power will allow.

In the beef cattle industry, it has been obvious for some time that a drastic change in management practices is necessary, as the local consumer has been demanding the type of meat which comes from a smaller younger beast. In the recent United Kingdom contract, provision was made for a "baby beef" class, which indicated that not only was there a demand for this type of beef in the United Kingdom, but the Australian producer was for the first time being encouraged to produce this type of carcass. Observing the trend that was developing, plans were laid early to meet the situation. For some time now, regular monthly weighings have been made of beef cattle from birth to maturity in the various districts of Queensland. From these will soon be known the growth rates in the various seasons of the year and the months when improved nutrition is necessary. This information is essential, for to market a younger prime animal there should be no setback during its life.

As a prerequisite to future changed husbandry methods, fodder conservation work is being encouraged by the Division in co-operation with the Division of Plant Industry. At the same time, the breeder is being encouraged to send forward his store cattle at a younger age. In order to demonstrate the value of this, the Department has made plans to walk a small mob of 18-months-old steers from the "Gulf" to the railhead, and then travel them some hundreds of miles by train to fattening areas on the Burdekin and at South Johnstone.

There appear to be a number of areas in Queensland in which large-scale fattening of "baby beef" can be developed. It has been shown already on a small scale on the Burdekin that cattle can be fattened on irrigated pastures, and it could well be that many thousands of steers will be fattened and slaughtered at the handy coastal works when this project is fully developed. The destination of very many stores from the Gulf and the Northern Territory may well be the Burdekin rather than more distant ones as at present.

The tropical pastures grown by the Bureau of Tropical Agriculture have been fattening cattle for some years now under natural rainfall; this indicates the possibilities of similar country on the far northern coastal areas.

Whilst the summer grain crops in Central Queensland may not have been entirely successful for the marketing of grain, there have been very encouraging indications that, used in association with stock or even marketed through stock, such crops may be a worthwhile proposition.

It is in this area that fodder conservation demonstrations and feeding trials are being carried out, for here again is an area from which it is believed many high quality young stock for slaughter could be produced and forwarded to nearby abattoirs.

When "chiller beef" was being produced in Queensland before the war, it was from the cereal growing areas of the State that most of the animals were obtained. These young steers, fattened on crops, were reasonably close to market and could be slaughtered and exported without much difficulty. This type of fattening is now increasing, and despite a temporary decrease due to lack of rain will probably expand. This expansion could be great if grain prices continue to fall, and might in the long run be to the advantage of the cereal industry and the soils of the area. Anticipating this trend, the area is being staffed with husbandry officers; by encouragement and demonstration, these officers are having no small success with local cereal growers.

Much that has been said in the foregoing would apply in some measure to the sheep industry in central and southern Queensland. Whilst the fattening and marketing of high-class beef will probably be more attractive and have a more certain market, there is need for an increasing supply of quality lambs for the Queensland consumer. This is at present limited by the difficulty of obtaining crossbred ewes for fat lamb mothers, but the Department is endeavouring to encourage fat lamb production and appointed an adviser to specialize in this type of work.

Whilst there does not seem to be room for much territorial expansion of the dairy industry unless a breed more resistant to heat and humidity is evolved, there is need for increased efficiency within the industry, and much is being done through the Dairy Industry Extension Grant to bring this about. The co-operative effort by the Animal Industry, Plant Industry and Dairying Divisions of the Department is accomplishing a great deal and should continue to do so. The husbandry of the industry is being changed from the grazing of natural pasture and seasonal dairying so as to include also the feeding of crops, improved pastures and limited amounts of concentrates, all of which should bring about increased production per acre.

As the dairying industry is effecting a degree of change from butter production to the marketing of wholemilk, it is to be hoped that production can be more evenly spread throughout

the year than at present. On the other hand, if stock fattening is to expand, it may be that some of the lands at present used for dairying will be used for beef production. In any event, improved pastures and more cultivated crops will be necessary.

It is becoming very evident that decreasing demand and increasing prices are limiting the output of the pig industry. On such a competitive market, there is no room for inefficiency. It is now becoming obvious to the pig producer that the quality of his product must be high and costs of production kept as low as possible.

The Department has always been concerned about the production of poor-quality carcasses, particularly the overfat pig, and has endeavoured to encourage the industry by carcass appraisal and other extension methods to improve the quality of the bacon pig. Carcass grading with incentive prices for high quality has been adopted in the Northern Pig Marketing Board area for some considerable time. It is encouraging that the southern pig industry is now considering adopting this principle.

For some time now extension officers have been aware of inevitable trends within the pig industry caused by the decreasing availability of skim-milk. It has consequently endeavoured to encourage pig farming on open range, the growing of pasture and crops especially for pigs, and the marketing of grain crops through pigs rather than as grain. This has brought about an extension of pig farming to the grain-growing areas and it does appear that the decrease in coarse grain prices, should this continue, will bring about a further expansion of the pig industry.

It would appear that the poultry industry is now settling down to supply the local market as its main objective. In times of world shortage, there is frequently an unlimited demand for our eggs, but this has slowly decreased as world production has returned to normal and it could disappear more or less entirely. When markets are unlimited, competition is not great and efficiency may suffer. The Department is aware of the need for improvement and is undertaking work to bring this about. Disease control and improved husbandry continue, but competitive tests to demonstrate such things as hatchability, rearability, livability and total egg production and egg weight, to encourage breeders to improve their stock, are now under way and facilities now being built will, it is hoped, enable the tests to be commenced early next year.

There is no room on a competitive market for the inefficient, and the Department is endeavouring to assist producers by demonstrating better methods of disease control and husbandry, to bring about improved egg production and egg quality.

IMPORTANCE OF EXTENSION METHODS.

With few exceptions, the staff are now working as a team, and this is being reflected in the increasing value of the Department's assistance to the primary industries. In such a large State as Queensland, with its widespread industries,

the spread of staff is necessarily thinner than in more closely settled States. To encourage more producers to adopt better husbandry methods an expanding staff of extension workers is needed. As producers come to accept these improved methods, the demand for the services of extension workers becomes even greater. It must therefore be accepted that increased and more efficient production demands more extension workers.

There are ways of making the limited staff more efficient by encouraging the producer himself to assist in this work. It is now becoming more evident that changing the attitude of producers to improved methods may be an essential prerequisite to the task of teaching them what to do. If leaders in the primary industries accept the need for improved methods and adopt them, they, by their example, will encourage other producers to follow suit.

Following the return from overseas last year of the Director of Sheep Husbandry, who spent some months studying extension methods in the United States, the application of these methods was commenced.

The first step was a school attended by the members of the Sheep and Wool Branch and also by a limited number of officers from other branches of the Division of Animal Industry, as well as the Divisions of Plant Industry and Dairying. Later other smaller schools were held by an officer of the Division of Animal Industry who had attended the first school. He has organized small conferences in each of a number of country districts, attended by the Departmental field officers stationed in those districts.

The control of disease by compulsion may be necessary with some individuals, but it is far better to endeavour to obtain the goodwill of stock-owners by making them members of the control team. To do this it is first necessary to convince them that disease eradication and control pay dividends. Accordingly, an attempt is being made to control pleuro-pneumonia through extension rather than compulsion. Pleuro-pneumonia is probably the most serious cattle disease in Australia, for unlike cattle tick infestation and tick fever, it is not limited to the hot humid coastal areas.

Whilst Victoria, New South Wales, and to a large extent south-eastern Queensland, are mostly free of the disease, it is constantly present in northern Australia and is spread to the southern areas by travelling mobs of store cattle moving southward to the fattening areas. The disease will continue to spread to these areas from the North until it is controlled in the breeding areas where it is enzootic.

Control and eradication will eventually be accomplished by inoculation and blood tests, but neither of these aids can be used successfully until property improvement assures complete musters.

Realizing that the complete co-operation and goodwill of the owners and their managers is needed, it has been decided to try the indirect approach. A careful check is being made at all

meatworks and the evidence of previous pleuro-pneumonia in cattle sent for slaughter is being recorded. The source of the cattle is discovered and these facts are passed on to a specially trained staff, who then go on to the property and discuss the problem with the owner or manager. These discussions include disease wastage and methods of control.

It is hoped that this approach will make it apparent to the owners that regular inoculation is necessary, that the most suitable time of inoculation is at weaning, and that more divisional fencing yards and watering points are necessary so that clean musters can be assured. This will be a long struggle, but it should not be between the Department and the stock-owner, but rather a struggle in which the industry and the Department are on the one side against the disease on the other. A start has been made in this type of campaign with pleuro-pneumonia, but similar information is being collected concerning tuberculosis in the beef industry, which is rather more common than was expected.

LEGISLATION.

During the year there was an amendment to "*The Diseases in Stock Acts, 1915 to 1952*," and a proclamation was issued on 26th November, 1953, bringing "*The Slaughtering Act of 1951*" into operation.

As a result of the amendment referred to above, the Diseases in Stock Acts are now styled "*The Stock Acts, 1915 to 1953*," and the "*Stock Diseases Fund*" the "*Stock Fund*." The reason for this is that the Acts now provide for husbandry services to the cattle, sheep and pig industries as well as for disease control and other services previously provided for.

The amending Act increased the rate of assessment that may be levied on cattle, horses and sheep (up to £2 per 100 head for cattle and horses and 10s. per 100 head for sheep) and provided for an assessment to be levied on swine (up to 10s. per 100 head). There was no previous provision with respect to swine.

A new power given to inspectors by the amending Act is the power to order destruction and disposal of travelling stock which are either moribund or injured to such an extent as to be incapable of being travelled without cruelty.

A new Regulation under The Stock Acts has placed a virtual prohibition on the introduction of dead wool from States in which the disease anthrax exists.

Preparing a new set of regulations to meet changed conditions in the butchering trade was attended with considerable difficulty and was the main reason for the long delay in proclaiming the new Slaughtering Act. There are 118 regulations and 13 schedules thereto.

Among many innovations are regulations relating to registration of butchers' shops and vehicles, control over smallgoods shops, and an increased minimum size for slaughterhouses. There is no longer provision for the issue of limited licenses to slaughter calves and pigs only.

BRANCH ACTIVITIES.

The following is a brief summary of some of the more important work of the Branches of the Division during the year.

Research.

Work with the newer insecticides was continued and it has now been demonstrated that a number of them are extremely useful as sprays. Dipping trials with toxaphene have given promising results.

The need for an efficient method of detecting animals infected with contagious bovine pleuropneumonia under station conditions with a minimum of handling has long been realised. Preliminary tests were carried out in North Queensland on infected and clean herds, with a rapid whole-blood slide agglutination test. The antigen used was prepared by C.S.I.R.O. The results failed to show close agreement with the complement fixation test, but the method will be examined further.

Studies on copper therapy have been extended to sheep, and field trials are being carried out in the north-west near Richmond. Of five groups of weaners, one received copper sulphate drenches once a month, one a copper sulphate drench at 6-monthly intervals, and two, copper glycinate injections at 6-monthly intervals. The fifth, a control group, is untreated. Progress results suggest that the simple procedure of giving a drench at 6-monthly intervals may be more effective than previously believed.

Laboratory tests with BHC, dieldrin and aldrin applied as a jet at .25% active principle have given 18-20 weeks' protection against body strike in sheep; concentrations even as low as .05% active principle gave 11 weeks' protection. These drugs were much superior to DDT. Jetting was superior to surface spraying.

Work at Yeerongpilly on leptospirosis has shown that *Leptospira pomona* is an important cause of abortions and stillbirths in pigs, thus confirming field evidence. All of six sows infected in the latter half of pregnancy farrowed approximately two weeks prematurely, producing 62 pigs, of which 54 were born dead. Only three of those born alive survived more than two days. Further, the sows excreted the organism in the urine for up to 84 days after infection. This finding illustrates the continuing danger of infected sows to other animals and man.

Both mineral and plant poisons continue to take toll of domestic animals throughout the State. Arsenical poisoning was diagnosed on 55 occasions in cattle, once in sheep, three times in pigs and twice in poultry. Feeding tests have been carried out on a number of additional suspected poisonous plants as well as on some previously under investigation. The most important information obtained in this respect was the conclusive establishment of *Acacia georginae* (*Georgina gidyea*) as the cause of mortality in cattle and sheep on Georgina River holdings. Whilst the pods are undoubtedly the main factor in causing these losses, this year's work showed that leaf regrowth in "ring-barked" country is also toxic.

Veterinary Services.

The dairy cattle tuberculosis control scheme has been further extended; seven new areas were gazetted and six additional approved veterinary surgeons granted contracts for tuberculin testing during the year. It is through this scheme that the Department has been able to increase the veterinary services available to country districts of Queensland. Practitioners in these districts not only assist the Department in the control of contagious and infectious diseases, but are available to the industry for the treatment of sickness and injuries affecting individual animals. Their numbers have increased from three in 1948 to 34 in 1954.

A survey of the incidence of tuberculosis in beef cattle indicated that this disease is more prevalent than was believed. It is a source of serious economic loss and is probably spread by the movement of stud and herd breeding cattle. A plan for the control of tuberculosis in beef cattle is receiving consideration, and it seems possible that veterinary practice may be extended to the beef industry in somewhat the same way as has happened with the dairying industry.

Activities associated with the control of contagious pleuro-pneumonia have been intensified and this disease is now receiving more attention than previously. The problem is being attacked by extension methods rather than compulsion. Financial assistance has been made available from the Commonwealth Extension Services Grant, and this has permitted the employment and equipment of two officers for extension work. The Department has also received assistance and co-operation from the Commonwealth Department of Commerce and Agriculture in tracing stock disease, particularly contagious pleuro-pneumonia and tuberculosis, at export meatworks. Information made available from this source is being used in follow-up work in the field.

Cattle Husbandry.

This Branch carried out a long and varied programme of field demonstrations, trials and investigations. A brief resume of the main items in the programme follows.

Concentrate feeding demonstrations were continued in one district—the Atherton Tableland. Previous work had indicated the necessity for ample supplies of good roughage in the ration in order to obtain worthwhile results from feeding concentrates. In these latest demonstrations an attempt is being made to ensure adequate roughage supplies throughout the year.

Further calf-feeding demonstrations were put under way. In these, limited milk feeding is practised in association with antibiotic supplementation and eud inoculation.

Trials and demonstrations directed at countering the effects of copper deficiency in both dairy and beef cattle were given special attention. A good response was obtained in some but not all cases when copper was administered by intravenous injection. Top-dressing pastures with copper sulphate and the

CATTLE TICK AND TICK FEVER WORK AT THE ANIMAL HEALTH STATION, YEERONGPILLY.



Plate 1.
HEREFORD BULLS IN STABLES FOR TICK FEVER
IMMUNIZATION.



Plate 2.
EXPERIMENTAL STEERS BEING ARTIFICIALLY INFESTED
WITH LARVAL TICKS.



Plate 3.
COLLECTING BLOOD FROM THE JUGULAR VEIN.



Plate 4.
INOCULATING A SHORTHORN BULL INTRAVENOUSLY.

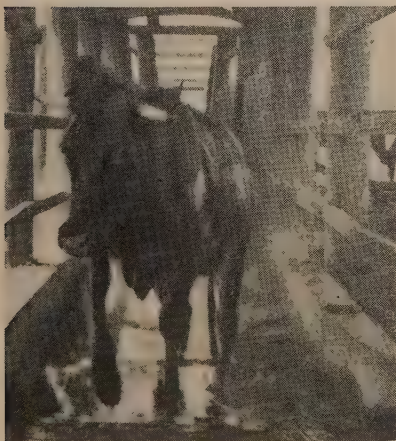


Plate 5.
STEER EMERGING FROM A DDT DIPPING VAT.



Plate 6.
TESTING AN INSECTICIDE FOR TICK CONTROL.



Plate 7.
THE HOMESTEAD AT TOORAK SHEEP FIELD STATION IN
THE JULIA CREEK DISTRICT.



Plate 8.
BALED BUSH HAY ON A CATTLE PROPERTY IN THE
SPRINGSURE DISTRICT.



Plate 9.
FEEDING CHOPPED FODDER INTO A SILAGE BLOWER AT
THE ANIMAL HEALTH STATION, YEEBONGPILLY.



Plate 10.
A STACK OF 1,700 BALES OF FLINDERS GRASS HAY AT
TOORAK SHEEP FIELD STATION.

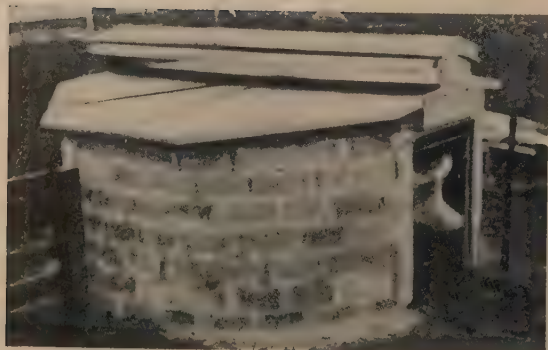


Plate 11.
A NEW TYPE OF FARROWING PEN NOW BEING TRIED
IN QUEENSLAND.

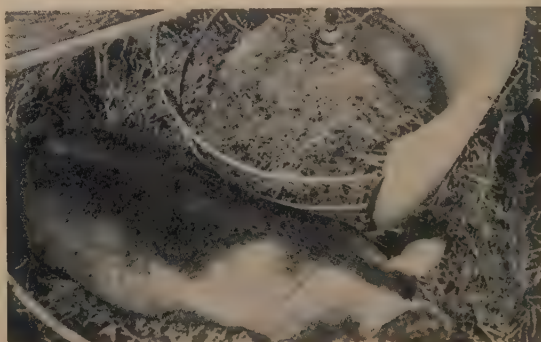


Plate 12.
INSIDE VIEW OF THE CIRCULAR FARROWING PEN
SHOWING THE CENTRAL PROTECTED AREA FOR THE
PIGLETS.

administration of this compound in the feed were shown to increase the level of copper in the blood of cattle, but there was little change evident in their production or condition as a result.

Demonstrations of the correction of phosphorus deficiency carried out embodied the feeding of sterilized bone flour and the drinking of water to which superphosphate had been added.

Studies on the feed intake of dairy cattle on pasture, employing a dye marker technique, were continued. Indications were obtained that the intake is much below requirements for full production at times, especially in winter and spring.

Field observations on the behaviour pattern of cattle, with special reference to their grazing habits, were continued by officers of the Branch at the Bureau of Tropical Agriculture, South Johnstone. A new set of observations was commenced on the dairy herd at Kairi Regional Experiment Station.

Sheep and Wool.

One of the most significant developments during the year was the attendance by the staff of a large pastoral company at a school of instruction organized by the Branch and covering various phases of sheep and wool production. The school was of five days' duration and was conducted at Brisbane.

All field officers of the Branch attended a special school of extension methods. The school aimed at forming attitudes, at helping officers analyse the methods they had been using in extension, and at discovering their respective strengths and weaknesses.

Officers engaged on extension work concentrated their energies upon two main programmes during the year—incorporation of fleece measurement in flock improvement programmes, and the conservation of fodder.

At the present time 38 flocks are using the facilities provided by the fleece measurement laboratory. Twelve of these are using measurement as an adjunct to other methods of selection. The results which have been obtained indicate that it would be possible to double or even treble the rate of genetic improvement in sheep by incorporating fleece measurement in flock improvement programmes.

The mitigation of drought in pastoral Queensland is a difficult problem. However, in 1952-53 the Department launched a campaign to popularise fodder conservation in the pastoral country. At the same time, producers commenced conserving hay, and up to 10,000 bales, equalling about 250 tons, were stored on each of a number of properties.

Some wool-growers commenced to grow crops in north-western Queensland in 1953. Encouraging results were obtained, and some of the sheep country may now be facing big changes in land use. It seems probable that more than 10,000 tons of silage was conserved this year. Up to 2,000 tons has been conserved on some individual properties.

An active programme of research work has been pursued. This has been carried out on the Toorak Field Station as well as on private properties. It has included investigations into low reproduction rates of flocks, the assessment of fleece quality, the toxicity of copper salts to sheep, the selection of sheep adapted to the tropics, and the feeding of bush hay.

Poultry Branch.

To encourage the greater use of sorghum as a grain feed for poultry, four feeding demonstrations were carried out on farms in the metropolitan and Near North Coast areas during the year. The demonstrations were for a period of six months with two groups, each of approximately 200 birds of the same age and breed. One of these groups was fed sorghum and the other wheat as the grain portion of the ration. The average "hen-housed" production for six months in the sorghum group was 91.8 eggs and in the wheat group 93.6.

Results from an antibiotic feeding experiment indicated that the response to procaine penicillin was greatest when it was fed to chickens reared in quarters where birds had been kept previously for a considerable time. This, however, was so only when the level of protein in the ration was 21%; it was not so at a level of 15%.

Further work on the use of sorghum in chicken rations is to be undertaken, as the results obtained from two experiments have been somewhat conflicting. Although the average weight of 8-weeks-old chickens fed a ration containing 60% sorghum was not as high as that of chickens fed 60% wheat, their growth was still satisfactory. Also there was no evidence of toxicity, for the deaths in the sorghum-fed groups were no higher than in the group fed wheat.

Three experiments were conducted to determine whether buttermilk powder in rations has any influence on the death rate when chickens are deliberately dosed with measured doses of oocysts. The results obtained from these experiments showed that 8% buttermilk powder in a chick starter ration had a marked prophylactic value in reducing the death rate of artificially infected chickens.

In breed-production experiments, White Leghorn x Australorp crossbreds were outstanding during the first year of production. The "hen-housed" average was a dozen eggs better per bird than that of Australorps and 20 eggs better than that of White Leghorns. As the White Leghorns are making a better showing in the second year, continuation of this experiment has been justified. It will obviously be impossible to make a final assessment of the relative merits of the birds under test until the end of the second production year.

Fifteen outbreaks of infectious laryngotracheitis occurred during the year, 13 of the flocks concerned being in the metropolitan area. Over 23,000 birds were vaccinated with a vaccine prepared at the Animal Health Station, Yeerongpilly, from a local strain of the causal virus.

Pig Branch.

The Australian Meat Board's Carcase Competition was again a success for the seventh successive year. The championship score of 92 points was a record. A feature of this year's competition was the increased number of farmers attending the district field days arranged in conjunction with the judging.

The cured baconer carcase competitions have gained in popularity and entries have increased. This type of competition is proving a very useful means of demonstrating to producers the type of carcase required by the trade.

Hermitage Regional Experiment Station piggery buildings have been completed and two Berkshire sows selected. These sows, together with a third sow and boar yet to be selected, will form the nucleus of a pure Berkshire herd.

The herd of Tamworth pigs at Kairi has been maintained. The services of the boar purchased in the previous year resulted in an improvement in the quality of the pigs marketed

at baconer weights. A young Large White boar was purchased in order to mate with young sows at the Station; progeny of this boar will be used for experimental work.

Experience so far in the use of an experimental circular type farrowing pen at the Station indicates it is likely to prove superior to the conventional farrowing pen for the first four or five days of the young pig's life. Such pens may be a means of reducing the State's annual loss of pigs during the period from birth to weaning.

The Brucellosis Testing Scheme continues to attract the attention of the industry. There are now 92 herds listed while a further 11 are undergoing preliminary tests.

In the Moreton area, further work in connection with the Commonwealth Extension Services Grant was carried out. There are four grazing demonstrations, a trial to demonstrate the value of supplementing garbage feed with meal, and two deep litter trials in progress.

DIVISION OF DAIRYING.

Director: Mr. E. B. Rice.



Mr. E. B. Rice.

The abolition of rationing and price control of dairy produce in Britain as from May 8, 1954, and the decision of the British Government to allow of a reversion to trader-to-trader arrangements for the importation of dairy produce from overseas countries after 15 years of Government-to-Government purchase agreements, are matters which may have a profound influence on

the dairying industry of Australia within the near future. However, the current agreement between the British and Australian Governments for the purchase of the exportable surplus of butter and cheese from Australia does not expire until June 30, 1955, and until that date the British Government will pay the contract price for all butter and cheese received from Australia irrespective of what price fluctuations may occur on the wholesale and retail markets in Britain.

The trends on the British market during the ensuing year will guide the Australian industry in formulating policy in respect of any altered circumstances which may arise from the changing market conditions in Britain. Already in the United Kingdom the selling prices for milk powders and cheese have tapered off and the position in relation to the future exports of milk powders to that market and other world markets at prices sufficient to maintain the present level of production of these products in Australia is not bright. The signs ahead can clearly be interpreted as indicating the need for taking all practicable measures to improve the quality of Queensland butter and cheese, for unless they satisfy the fundamental merchandising requirement of uniformly high quality, they could be placed in a more precarious position on a more competitive and selective market than the uniformly high quality products of other countries.

A prerequisite to the production of high quality manufactured dairy products is the receipt at the factories of high quality basic raw materials, and therefore a major responsibility rests with producers to take positive steps to supply to the factories a higher proportion of choice grade cream and first grade milk.

More general attention on farms to two factors would bring about this desired objective. They are the better cleaning of milking machines and the provision of cooling facilities on farms.

SEASONAL CONDITIONS.

Seasonal conditions were unsatisfactory during most of the year in the main dairying districts. Below-average rainfalls were recorded in most districts from July to December. Although there was heavy flood rainfall in January and February, some setback to dairying

occurred even during this period because of flood damage to pastures and crops. Following these rains, dry conditions were experienced until late May.

There was ample paddock feed in most districts from January to June, but production declined sharply after February, due to the low autumn rainfall, which caused pastures to dry off and become of low nutritive value. Good rains in many districts in June have ensured reasonable condition in cattle until the spring of 1954.

The adverse seasonal conditions were also reflected by a decline in the quality of butter and cheese compared with the previous year.

BUTTER PRODUCTION.

The quantity of butter produced was 41,798 tons, compared with 49,425 tons in the preceding year. Production was the lowest recorded in any year since 1944-45, with the exception of the two serious drought years of 1946-47 and 1951-52.

The serious deterioration in butter quality during the year is shown by the following figures:—

Quality.				1953-54.	1952-53.
				Per Cent.	Per Cent.
Choice Grade	..	..	..	29.81	46.96
First Grade	..	..	..	61.71	46.75
Second and Other	..	..	..	8.48	6.29

The indications are that under the altered marketing conditions in Britain, no immediate difficulty will be experienced in selling the exportable surplus of butter from Australia. However, taking a long-range view the market may become more discriminating and keener competition may be expected from butter substitutes. Every effort must therefore be taken to raise the quality of Australian butter in order to reduce as far as possible the shipment overseas of butters below choice grade.

The Australian Agricultural Council has in recent months given consideration to the desirability of widening the price differentials between choice grade cream and cream of other grades, as it is believed that action in this direction would be the most effective means of achieving a substantial improvement in the percentage of choice grade butter produced. A conference of Government officers and industry representatives is to be convened with a view to submitting to the Council recommendations designed to formulate uniform proposals for Australia-wide adoption.

The Dairy Industry Investigation Committee appointed by the Commonwealth Government to advise on the price to be paid during 1953-54 to producers for that portion of the production of butter and cheese which is subject to the guaranteed price recommended that, although

the farm costs of production were estimated at 1.72d. per lb. commercial butter in excess of the guaranteed price of 4s. 1.29d. per lb. for 1952-53, there should be no change made for 1953-54, as any action which might increase exports at prices below the ascertained cost of production could endanger the stability of the industry. The Commonwealth Government accepted this recommendation and continued the guaranteed price on the same basis as in 1952-53.

A feature of the year was the amount of new equipment installed in butter factories, £178,000 being expended in this connection. The modern machinery purchased will facilitate the handling of cream at the factories and assist in more efficient processing. The progressive action taken by so many factories is commendable and should assist not only in reducing manufacturing costs but also in improving the quality of butter in the future.

CHEESE PRODUCTION.

The output of 6,746 tons of cheese was, except for the drought year of 1951-52, the lowest recorded since steps were taken to expand cheese production in the early war years. The decline in the year under review was to some extent influenced by the increased quantities of milk drawn from cheese factories for the liquid milk market in order to make up for deficiencies in the normal supply sources of that market. Six cheese factories are now regularly supplying milk for the Brisbane milk market.

Having regard to the difficult seasonal conditions, cheese quality can be regarded as reasonably satisfactory, as the percentage of first grade was above the average for the past 15 years. The official grading results were:—

First	77.68
Second	20.74
Third	1.58

It is fortunate that Queensland cheese quality has been appreciably improved over the past 15 years; the average percentage of first grade cheese has risen from 34 to 76.

A pleasing feature has been the marked improvement in the quality of the cheese produced during the year at some factories.

The changing marketing conditions in Britain will pose more difficult conditions for the cheese industry than for the butter industry. The retail price of cheese fell in Britain as soon as rationing and price controls were lifted. Moreover, about 50% of Australian cheese production is exported, in contrast to about 30% of butter.

£35,000 was spent by cheese manufacturers in providing new equipment at their factories. Only four small factories are now manufacturing cheese from unpasteurised milk.

MARKET MILK AND OTHER PRODUCTS.

Milk for the Brisbane milk market continues to be drawn in increasing quantity from country chilling factories, approximately 70% of the total metropolitan requirements during the year under review having been obtained from these sources. Market milk quality was generally satisfactory. Some quality trouble was experienced during the dry conditions in the late

winter and spring of 1953, although low butterfat tests were a less serious problem during that time than for some years past.

The installation of refrigerators on farms is being accelerated as electricity becomes reticulated into further country areas. Appreciable improvements were effected to factory buildings, and much new equipment was installed at both metropolitan and country factories.

The Milk-in-Schools scheme was extended to further country centres where supplies of pasteurised milk are available, and it is estimated that about 74% of all eligible school children in Queensland are now embraced by the scheme.

The fall in the prices of milk powders on overseas markets has tended to cause a decline in the production of these products, but interest continues in the drying of buttermilk for local markets. A factory equipped with spray-drying machinery commenced operations during the year; it is concentrating on the production of skim-milk powder, which is used partly for the ice-cream trade and partly for packing into consumer-size tins. Another new factory which commenced operations is for the time being making roller-dried wholemilk powder for the confectionery trade, pending the installation of spray-drying machinery.

DAIRY BUILDINGS AND EQUIPMENT.

Owing to the freer supply of materials, 555 new dairy sheds were constructed and 506 existing buildings were renovated. Considerable progress was made in providing equipment at dairy sheds, and this should assist in efforts to improve the quality of milk and cream.

A survey revealed that about 16,500 farmers, representing about 80% of factory suppliers, are using milking machines. The average number of units per machine is 3.3. New milking machines installed during the year totalled 691.

MARGARINE.

The quantity of table margarine produced was 1,710 tons, compared with 913 tons in 1952-53. New factory premises being constructed by two companies are nearing completion and both factories will be equipped with the most modern plant.

HERD PRODUCTION RECORDING.

Pure-Bred Recording Scheme.

A total of 146 stud dairy cattle breeders entered their herds under this scheme during the year. The total number of cows recorded was 1,375. Their average production was 586 gall. of milk and 271 lb. butterfat; 695 cows, or 44.6 of all recorded cows, qualified for entry into the Advanced Register of the respective pure breed dairy cattle societies. Detailed information on the performance of cows, according to age and breed, is given in the report of the Director of the Field Services Branch.

Group Recording Scheme.

Interest in this scheme was well maintained, the number of groups being increased from 50 in the preceding year to 55 during the current year. About 40,000 cows are included in the

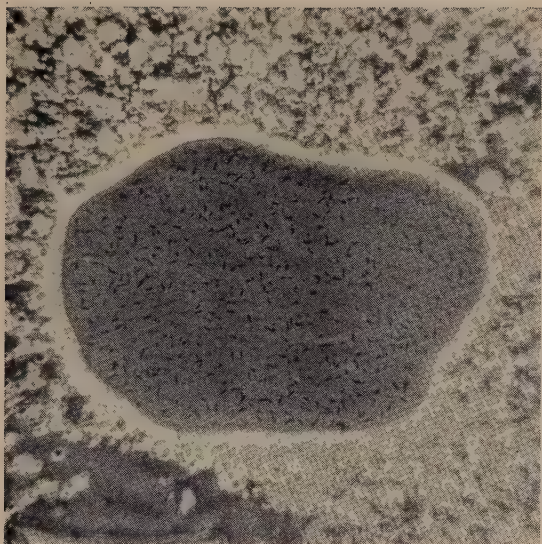


Plate 1.
BACTERIA ARE TO BE SEEN IN THE LARGE WATER DROPLET IN THIS DEFECTIVE BUTTER.



Plate 2.
A CORNER OF THE REGIONAL DAIRY RESEARCH LABORATORY AT MALANDA, ON THE ATHERTON TABLELAND.

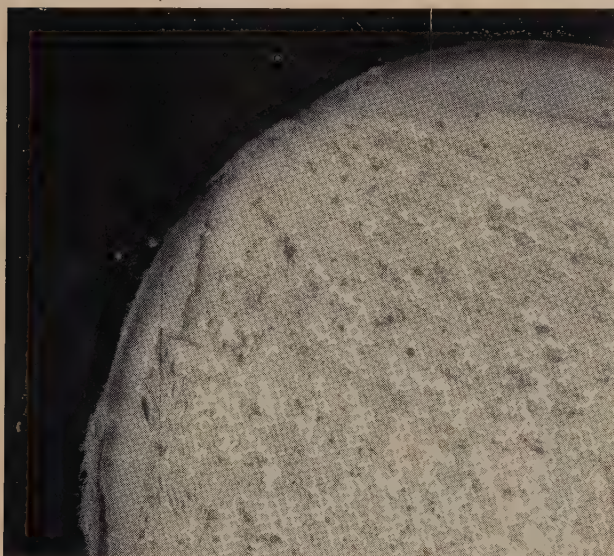


Plate 3.
CHEESE AFFECTED BY COLIFORM BACTERIA.

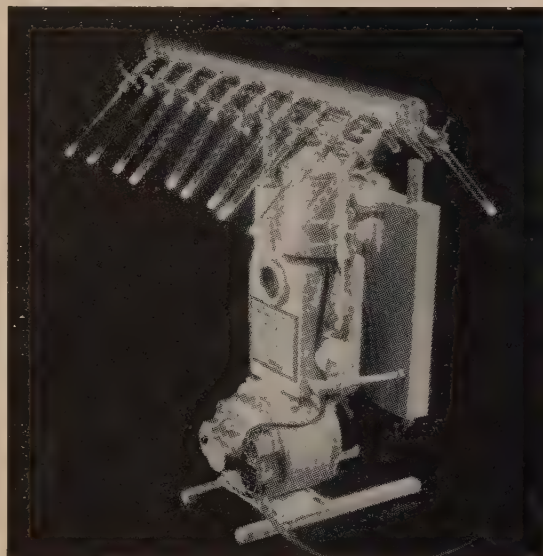


Plate 4.
EQUIPMENT USED FOR THE FREEZE-DRYING OF CHEESE STARTER CULTURES.



Plate 5.
THE THREE PLUGS OF CHEESE FROM THE LEFT SHOW THE DEFECT MECHANICAL OPENNESS. THE DEFECT HAS BEEN CORRECTED IN THE CHEESE FROM WHICH THE PLUG AT RIGHT WAS TAKEN.

production-recorded herds. The 30,304 cows which completed lactations in the 1,073 herds had an average production of 348 gall. of milk and 150 lb. butterfat. Their average length of lactation was 210 days.

As more data are becoming available from production recording, it is possible to carry out surveys which provide valuable information for the guidance of Departmental officers and producers on various aspects of herd management. These surveys are, for instance, showing the serious loss of production occasioned by the short lactations of many cows. During the past year slightly less than one-third of the recorded cows milked for nine months and their average production was 195 lb. butterfat, while the average production of cows which milked for less than nine months was 130 lb.

A disturbing feature revealed by the survey was that slightly over one-fifth of the cows milked for less than five months for an average yield of 71 lb. butterfat. It is obvious that the key to prolonging the lactation period of cows is better feeding, and this can be most economically attained by improved pastures, better grassland management and conservation of fodder. The calving of cows during the months of July to September will also enable them to be in production during the most favourable pasture season.

Another survey has shown that, within breeds, there is a strong correlation between the butterfat percentage of the milk of cows and their total yield of butterfat.

A survey of the causes of herd wastage which has been continuing for several years has shown that, due to developments in preventive treatment, the culling of cows through udder troubles is decreasing significantly.

Extension work in connection with the Herd Recording Scheme has been intensified during the year through inter-Divisional co-operation, and it has been obvious from the keen interest displayed that this service is appreciated by farmers.

COMMONWEALTH DAIRY INDUSTRY EXTENSION GRANT.

The Commonwealth Government approved of the continuation of this Grant for a further period of five years from July 1, 1953. The overall results obtained during the first 5-year period can be regarded as having justified the scheme.

A major activity of the Division was the setting up of demonstration farms, the selected farms being a typical cross-section in their respective degrees of efficiency of farms throughout the State. Taking 1948-49 as the base year, the demonstration farms in 1952-53 produced the equivalent of 133% of the base year, whereas overall production on Queensland dairy farms in 1952-53 was only 4% above that of 1948-49.

A general improvement in production on Queensland farms equivalent to that of the demonstration farms would, based on a normal yearly production of 100 million pounds of butter, increase the State's butter production by about 30 million pounds, valued at £6,000,000.

The choice grade cream produced on the demonstration farms increased, as a result of the application of better techniques, from 73% to 84%, whereas the corresponding grading results for cream at all Queensland butter factories for 1948-49 and 1952-53 were 60% and 62% respectively.

During the current term of the Grant some modification of the demonstrations has been made with a view to spreading the work over a larger number of farms and a wider area. The demonstration is being confined to one aspect of management on each farm, and to a limited area of the farm. The main types of demonstrations include drainage, pasture establishment under dry farming and irrigation, legume establishment, strip grazing of fodder crops, fodder conservation, cooling of milk and cream, and dairy hygiene, particularly methods of cleaning milking machines.

Field officers have been provided with 35 mm. cameras for use in recording progress on the demonstrations and to enable the building up of an extensive library of slides and films for use at farmers' meetings and discussion groups as a means of drawing attention to, and stimulating interest in, practices being demonstrated on the farms.

RESEARCH AND LABORATORY CONTROL SERVICES.

A further step in the decentralisation of the laboratory services was the opening of a branch laboratory at Malanda. This, with the existing laboratories at Toowoomba and Murgon, makes three laboratories in country centres.

Investigations.

Milk.—In some countries of the world where adequate supplies of fresh milk are not at all times available, action has been taken to reconstitute milk from skim-milk powder and butterfat. In certain parts of Queensland, such a development may be a means of providing a satisfactory milk supply, and to this end experiments have been carried out on reconstituted milk. The trials indicate that local products are suitable, but careful selection of the butterfat by laboratory tests is necessary to avoid any susceptibility to oxidation and impairment of the flavour of the reconstituted milk.

It is well known that the inclusion of milk solids in bread improves its keeping quality and texture. Trials with skim-milk powder and buttermilk powder have been carried out to compare the quality of the bread in which both products are included. They suggest that buttermilk powder, which is produced in Queensland, may be a satisfactory substitute for skim-milk powder.

Investigations on the problem of overcoming the seasonal decline in the fat percentage of milk in the late winter and early spring have been continued. Although not conclusive, the results suggest that the feeding of long hay to cows after the evening milking will result in the milk on the following morning conforming with the legal minimum fat percentage. Work will be continued with a view to determining whether the quality of the long hay is a factor.

Cheese.—Trials have been carried out on a method aimed at reducing the costs of manufacturing cheddar cheese. Instead of cheddaring and milling the curd in the normal way, it was kept in the granular stage until placed in the cheese moulds. The method enabled the making time to be reduced by about two hours, but the cheese had a granular texture. Further trials are envisaged, when a modification will be introduced with a view to developing a typical cheddar texture. Studies on factors affecting the cheese yielding capacity of milk have shown the most important to be the casein content of the milk. At the factory where the trials are being conducted, the casein content during the year varied from 2.15% to 2.71%, whereas the fat content varied only from 3.9% to 4.1%.

Work is also proceeding to determine factors which influence not only cheese yield but the suitability of milk for cheesemaking.

It has been shown that the cooling of milk can assist in improving the quality of cheese. Batches of cheese made from cooled milk graded at least one point higher than those made from uncooled milk. However, cooling cannot be used as a substitute for hygienic milk production, as some cooled milks failed to satisfy a 3-hour methylene blue test and disappointing grading results were obtained with the cheese produced from such milk.

Open texture is a common defect in Queensland cheese. It has been shown that one factor affecting the openness is the salting of the curd without allowing sufficient time for mellowing. Other aspects of this problem are under investigation.

Butter.—To produce butter which keeps well during cold storage it should have a pH not below 6.8 and traces of copper and iron contamination from equipment should be kept to a minimum. The influence of these respective factors and changes in the composition of butterfat on the susceptibility of butter to oxidation defects is being further studied.

Following satisfactory laboratory trials on the treatment of churn timbers to prevent deterioration through fungus attack, the treatment was extended to two churns which were installed in factories in order to observe its effectiveness under factory conditions. After 10 months' use, one churn has shown no evidence of fungus attack on the woodwork.

Trials on the possibility of improving the keeping quality of cream by washing it after separation and re-separating to a high butterfat content have not given encouraging results, in contrast with some reports from similar overseas experiments. Bacterial development was retarded in the washed thick cream, but oxidation defects caused off-flavours.

Laboratory Control Schemes.

As an indication of the work involved in routine control schemes it may be mentioned that over 300,000 methylene blue and fat tests were carried out at factories, nearly 33,000 tests

of various kinds were made in the Departmental laboratories, 11,000 pieces of glassware were tested for compliance with the standards prescribed under the Dairy Produce Acts, 955 cheese starter cultures were distributed, and 127 visits were made by officers to carry out technical surveys in factories to assist in various aspects of processing and control of quality.

The routine laboratory examinations of butter showed that the standard of hygiene in factories was reasonably good and a satisfactory standard of composition of butter was being achieved. Since the microscopic test for moisture-droplet distribution in butter and the pH test have been introduced as routine tests, it has been noticed that factories are paying more attention to producing a close textured butter of good keeping quality, but there is room for improvement at a few factories.

Milk supplied to milk pasteurisation factories has been generally satisfactory. Although the efficiency of processing in most factories was of high standard, action was necessary to bring about improvement at a few factories. The phosphatase test, used to indicate the efficiency of processing, revealed very few instances of defective treatment. As soon as any fault was detected, immediate action was taken to trace the cause at the factory and rectify it. Samples of milk supplied under the Milk-in-Schools scheme were regularly tested to ensure that this milk conforms with the desired standards.

Due to the wider adoption by cheese factories of recommended procedures for the propagation of starters, the incidence of starter failures has been reduced.

Samples of cheese taken by field officers have been analysed with a view to affording guidance to factories on the control of composition.

The "in place" cleaning of factory equipment with dilute solutions of nitric acid and alkalis is gaining in popularity in some countries because of the saving in labour costs through not having to dismantle the equipment completely every day. Trials with this cleaning procedure were initiated at one cheese factory, but it was found that the factory water supply was unsuitable. In contained a relatively high quantity of soluble chlorides which, on reacting with the nitric acid, liberated free hydrochloric acid, and as incipient pitting of the stainless steel equipment was noted, the trials were abandoned. This method of cleaning would not appear to offer promise of success at many Queensland dairy factories which have to depend on well and bore waters which contain appreciable quantities of soluble mineral chlorides.

STAFF.

One permanent officer resigned during the year, six new appointments were made and five transfers effected. The Director of the Research Branch attended the World's Dairy Congress in Holland and later observed practices in several leading European dairying countries.

One scholarship holder who completed his course of studies at the University of New Zealand returned to Queensland and took up duties with the Division in accordance with the terms of the scholarship agreement.

DIVISION OF MARKETING.

Director: Mr. H. S. Hunter.



Mr. H. S. Hunter.

The ending of the 12 months' period covered by this report coincides with the removal in the United Kingdom of the last of the food-stuffs rationing schemes. The transition to private trading in agricultural products from the Government to Government trading, which characterised the war and post-war years, now is well advanced

and price and other controls originally imposed under the stress of emergency are being gradually removed.

These changes in our principal overseas market, made possible by the recovery of agricultural production throughout the world, are of prime concern to our agricultural industries and to their marketing boards. We are reminded of this by the fact that the changes, in most cases, have been accompanied by substantial price falls for the commodities concerned.

The fall in egg prices on the United Kingdom market, which reduced returns for Australian exports by over 11d. per dozen for the 16 lb. pack as compared with the 1952-53 season's price, proved so serious for the poultry industry that the Commonwealth Government came to its assistance with a special grant of £250,000.

Price falls having a less serious impact upon Australian industries have occurred also with wheat, the coarse feed grains and edible oils. Butter and cheese contracts with a year to run help to sustain the dairying industry, supported by guaranteed prices for butter and cheese on the domestic Australian market, but a decline in overseas demand for preserved and processed milk and a per capita consumption of margarine in the United Kingdom for 1953 of more than double the average for the pre-war years 1934-38 are pointers to the competition which must be faced in the future.

The restoration to the consumer of his freedom of choice places a renewed emphasis upon the importance of quality. Agriculture in Queensland, with its system of statutory commodity boards joined for purposes of common interest in their membership of the Council of Agriculture, has an organisation which could be geared to co-operation with the Department of Agriculture and Stock in efforts to assist the various industries to meet this challenge.

STATISTICS AND ECONOMIC ANALYSIS.

The uncertainties in the marketing situation have given a new importance to the Division's economic analysis and statistical work. This is referred to in some detail in the Marketing Branch section of this Report.

This work includes production forecasting for eight separate crops compiled after

analysing reports received from over 700 selected farmers as honorary crop correspondents. It includes also statistical analysis of Brisbane wholesale fruit and vegetable prices, obtained over a period of six years by the Division's market reporters, to provide a basis for further economic study of various fruit and vegetable crops.

The Council of Agriculture, in recognition of the importance of the Department's Marketing Division being fully informed of the organisational practices and marketing techniques adopted in other countries, decided at its 1953 Annual Conference to invite its constituent Boards to subscribe the funds necessary to send a Marketing Officer overseas provided the Government would make an officer available. The various Boards have all agreed to contribute to such a fund and the Commonwealth Trading Bank of Australia has generously offered to supplement their contributions with a grant of £500 in aid of the project.

MARKETING BOARDS.

During the year preliminary action was taken for the winding up of The Arrowroot Marketing Board and The Potato Marketing Board, both of which have ceased to operate.

For some years growers and millers of arrowroot have not all supported the Board. A meeting of suppliers decided no good purpose would be served by continuing it in existence. The Arrowroot Board, which was originally constituted on December 1, 1922, was the first Board to be established under "*The Primary Products Pools Act*."

In the case of The Potato Marketing Board, the Government refused to grant a further extension of the Act to potatoes after the conclusion on March 31 of the Board's second 3-year term. The reason for non-extension was the failure of potato growers adequately to support their marketing board. When the Board went out of existence its assets amounted to approximately £28,000. This amount consisted approximately of £5,500 in a revolving levy account, £13,000 in an administrative levy fund, £5,500 surpluses from previous pools, £1,000 reserve fund and £3,000 undistributed final payments in respect of the 1953 spring crop.

Considerable improvement has been experienced this year in the marketing of tobacco leaf. Competition has been increased at auctions conducted by The Tobacco Leaf Marketing Board by the buying of a large overseas company which intends extending its manufacturing operations to Australia, and by the impending increases in the statutory percentage of Australian leaf which must be incorporated in tobacco mixtures to qualify the manufacturer for concessions in import customs duty. The percentages are to be increased from 10% to 12½% from July 1, 1954, and to 17½% from July 1, 1955.

To the end of June, 1954, a total of 2,965,358 lb. of leaf had been offered for the current season. Of this, 2,795,287 lb. (94·26%) had been sold at an average price of 145·97d. per lb. This compares with a total offering of 3,589,713 lb. during the 1953 sales, of which 3,218,331 lb. (89·7%) was sold at an average price of 103·21d. per lb., while for the 1952 sales leaf offered was 5,315,685 lb., of which 4,321,974 lb. (81·3%) was sold for an average price of 84·58d. per lb.

The discontinuance of two marketing boards leaves 18 in operation and two non-marketing boards—The Queensland Cane Growers' Council and The Queensland Dairymen's Organisation.

Some of these marketing boards have been spectacularly successful. The Committee of Direction of Fruit Marketing, for example, a somewhat unique type of producer organisation, has increased its volume of business from £162,052 in 1935-36 to £4,597,209 in 1952-53. In the latter year the C.O.D.'s Northgate cannery added a sum of £2,771,919, thus making the turnover of the organisation £7,369,128.

Another board, The Butter Marketing Board, has been in operation for almost 30 years. This Board controls the marketing of butter throughout Queensland and its operations are closely integrated with those of the State Dairy Products Stabilisation Board and the Commonwealth Dairy Produce Equalisation Committee Ltd.

One sphere in which the Board has advanced in recent years is in its operations at Hamilton where butter is patted for the requirements of Brisbane, and in addition butter concentrate, ghee, canned butter and fresh butter in pats and bulk are packed for various export markets. Refrigerators for farm storage of milk and cream are also manufactured. The expansion in these fields has been such as to necessitate the construction of new buildings which will cost in the vicinity of £433,000. For the year ended June 30, 1953, sales by the Board's Hamilton factory were approximately £4 million. By comparison, in the pre-war year the net sales figure was only £816,000.

Successes of this kind have been due to a combination of good direction by Boards of elected representatives with unusually capable advice and administrative control by their chief executive officers. Mr. Bernard Flewell Smith, General Manager of the C.O.D., not only controls this large and somewhat complex organisation with its powers of direction democratically controlled by the growers; its commission agency sections in the Brisbane and Sydney markets; its fruit trains; its wholesaling and retailing of fruit and vegetables from Cairns to Albury and into the far west of Queensland; its merchandising and fruit processing for local and overseas markets; but also represents producers of canned pineapple and canned pineapple juice on the Australian Canned Fruits Board. In addition, he is the representative of the C.O.D. on the Board of the Australian Producer's Wholesale Cooperative Federation Ltd., which with co-operatives in South Africa and Southern Rhodesia is an owner of Overseas Farmers Cooperative Federation Ltd. of London, an organisation which handles British

Commonwealth products. During the year Mr. Flewell Smith, as one of three delegates, conferred in London with the other joint owners on policy matters affecting this latter organisation.

The Butter Board Secretary, Mr. Chris. Sheehy, O.B.E., who was recently honoured by Her Majesty The Queen for his achievements in this field of service, assisted in the establishment in 1921 of the first marketing board, viz., The State Wheat Board. He is today regarded as one of the greatest authorities in Australia on dairy produce marketing. Mr. Sheehy is also General Manager of the Commonwealth Dairy Produce Equalisation Committee Ltd., and Chairman of the Australian Dairy Produce Board. In the latter capacity he represented the industry during the year at discussions with the Ministry of Food in London in the negotiation of prices to apply under the butter and cheese contracts.

WHEAT INDUSTRY STABILISATION.

During the year "*The Wheat Marketing (Amendment) Act of 1953*" was passed. This Act amended "*The Wheat Industry Stabilisation Acts, 1948 to 1951*" by removing the stabilisation provisions and by extending the authority of the Australian Wheat Board for a further period of three years commencing with the 1953-54 season. The other States passed similar Acts which were complementary to an Act passed by the Commonwealth Government. Under the legislation, wheat growers are guaranteed a price for wheat sold in Australia of 14s. per bushel f.o.r. ports, or the ruling International Wheat Agreement price, whichever is the lesser, provided the price is not lower than the ascertained cost of production.

The legislation abovementioned overcame the crucial time factor and enabled the Commonwealth Government to adhere to the International Wheat Agreement.

It yet remains for the various Governments and the wheatgrowers of Australia to decide whether provisions for another stabilisation scheme are to be superimposed upon this orderly marketing plan.

AGRICULTURAL STANDARDS.

The Agricultural Standards Act has been in operation for nearly two years and has fully justified the consolidation of the legislation relating to the control of seeds, fertilizers, growth regulating materials, lime, stock foods, veterinary medicines and pest destroyers.

The Agricultural Standards (Stock Foods) Regulations of 1953 have now replaced the Stock Food Regulations previously in operation. These regulations now include standards for the various types of poultry mashes, calf meals and dairy feed meals. The regulations fix a minimum amount of crude protein and fat, maximum amount of crude fibre and salt and proportions of other ingredients that may be present in poultry mashes. Calf and dairy meals are also required to contain a minimum amount of crude protein.

The Agricultural Requirements Board approved the registration of 2,137 preparations and refused registration of 12.



Plate 1.—Wheat Delivery Centre at Brookstead. Showing New Single Bin Bulk Handling and Storage Unit.



Plate 2.—Queensland's First Bulk Wheat Elevator at Brookstead has a Storage Capacity of 200,000 Bushels.



Plate 3.—A Section of the Battery of 20 Egg Pulp Vacuum Extractors in Operation at the Egg Marketing Board's Premises.



Plate 4.—Canning Pre-Cooled Egg Pulp Prior to Blast Freezing.

Vigilance was maintained on the quality of all commodities coming within the scope of the Act and necessary action taken; for instance, 3,621 lb. of vegetable seeds and 22,597 packets of vegetable seeds for home garden use were destroyed.

The services of the seed testing section have been in such demand by sellers and exporters of grain that difficulty has been experienced in maintaining its function as an aid to the administration of the Agricultural Standards Act.

The international rules for testing of seeds were reviewed at a conference at Dublin in May 1953. Queensland was not directly represented but officers of the Commonwealth and Victorian Governments attended on behalf of all

Australian States. As a result of suggestions included in the proceedings of this conference, a considerable amount of exploratory work has been undertaken in order to check the results of germination tests under temperature conditions used in this State.

SEED CERTIFICATION.

The work of seed certification continued to expand. This was particularly so in the case of hybrid maize, where the amount of seed certified was double that of the previous season. As a result approximately 2,000 bus. of seed are being carried over for sale next season. Other seeds for which certification schemes operated are grain sorghum, beans, cowpeas and tomatoes.

REPORTS OF BRANCHES.

AGRICULTURE BRANCH.

Mr. W. J. S. Sloan, Director of Agriculture.



Mr. W. J. S. Sloan.

From the agricultural viewpoint, the dominant note in 1953-54 was the change in emphasis from expansion of production to cost of production. Whilst considerable expansion to meet home demands is still required in some industries, particularly tobacco and cotton, problems are beginning to appear in regard to the economic disposal of exported agricultural produce.

Trends in the world markets demand that costs of production be held at least static and if possible lowered in order that competition from other producing countries can be met. In primary industry, as in any other industry, it is the efficient operator who best weathers the period of low prices caused by limited purchasing power or (less frequently) gluts.

Costs of production can be influenced materially by the degree of efficiency of farming methods. It is very desirable, therefore, that farmers use properly the tools of knowledge provided by agricultural scientists. In some instances this knowledge can be applied without involving the farmer in any expense. Such is the case with new crop varieties, and the release this year of new Departmentally bred varieties, Bovah oats and Sweet Sudan grass, is an excellent example.

High quality seed is another method of increasing production and so lowering the cost of production. After several years of patient work the efforts of the Seed Certification Committees dealing with seed of hybrid maize, grain sorghum, sweet sorghum, Sudan grass and cowpeas are now yielding substantial results.

The production of certified seed of hybrid maize and grain sorghum is now sufficient to meet present-day demands. The field organisation of certified seed production of agricultural crops is one of the notable achievements of Agriculture Branch officers in the post-war years.

Stock-owners in all districts have continued to exhibit very keen interest in pasture improvement, an interest which has been particularly pronounced in the last five years. There is a rapidly growing realisation that sown pastures should be treated as a crop and that careful management of native pastures is likely to give better results than indiscriminate stocking. Buffel and green panic grasses are two comparatively new grasses which are being sown on an ever-increasing scale. The sowing of summer pasture legumes such as centro (*Centrosema pubescens*), phasey bean (*Phaseolus lathyroides*), stylo (*Stylosanthes gracilis*) and Townsville lucerne (*Stylosanthes sundaica*) is limited only because of inadequate supplies of seed. The matter of improving the seed supplies of pasture legumes and grasses is a serious one and is receiving attention.

Awareness of the value of irrigated pastures in Queensland has been greatly stimulated in recent years. An area of irrigated pasture or lucerne is an excellent insurance against drought. That this is being appreciated more and more by stock-owners is clearly shown by the numbers of enquiries for assistance which are received.

Although the beef cattle in the grazing trials at the Bureau of Tropical Agriculture are there mainly for the purpose of eating the pastures so that the reaction of pastures can be studied, the financial results are of interest. The complete data for the full 12 months' grazing cycle which was completed in September 1953 show that there was a gross profit of £9 10s. per acre after allowing for one death out of the 16 animals used and for freight and droving charges.

Stocking rate was a beast to 1½ acres in 1952-53. In 1953-54 the return per acre is expected to be higher because the grazing rate has been lifted to one beast per acre.

It is hoped that the value of the tropical pasture investigations will find fullest expression in the development of rain-forest areas too steep for cultivation and on the poorer forest soils of the coastal flats. It has been shown that adequate pasture growth is readily attainable on the former, but the establishment of permanent high-quality pastures on the forest areas still poses some problems.

The use of chemicals in agriculture is now well established, but hormone weedicides with their selective action have provided land-owners with an entirely new weapon in the fight against weeds. Weeds draw precious moisture out of the soil, a loss which farmers in the lower rainfall areas can ill afford.

Most field officers have reported that the use of machinery for applying hormones for weed control in pastures and crops is increasing. The use of these chemicals for destroying standing brigalow promises to be a development rivalling in importance the spectacular achievement of *Cactoblastis cactorum* in destroying prickly pear.

The importance of taking measures to protect the soil against soil erosion and loss of productive power is now appreciated by progressive farmers in all agricultural areas. The task of organising soil conservation measures, especially the construction of mechanical protective structures, is a formidable one. It is certain that the problem can only be solved by complete co-operation between farmers, local authorities and contractors. The entrance of private contractors with earth-moving equipment into the field of soil conservation is therefore of particular interest. There was also further evidence during the year of good co-operation with local authorities.

The demand from primary producers for agricultural advisory services continues to be heavy. The opening up of new lands for agriculture at Wandoan, Emerald, Eungella Range, Innisfail and Millaa Millaa will require assistance from local advisory officers. Already officers have been active in advising new settlers on the proper methods of grassing burnt scrub areas and on suitable crops to cultivate.

It is impossible to provide an adequate farm-to-farm advisory service throughout Queensland because of the sparse population and long distances to be travelled, but extension work is carried out by publications, wireless talks, field days and displays at shows in addition to numerous farm visits. Demonstration plots are used as freely as possible within the capacity of the field staff to handle such projects. Field days with groups of farmers on trial plots and night meetings using coloured slides of local interest have been found to be effective extension methods.

A very important staff appointment was the re-creation of the position of Director of Tropical Agriculture, South Johnstone. Expanding agricultural activities in North Queensland make it essential to have on-the-spot supervision of experimental work and advisory services. Mr. D. O. Atherton, formerly Director of Agriculture, has accepted this important post and he commenced duties at South Johnstone in April 1954. The Directorate of Tropical Agriculture embraces district offices from Ayr north.

The recent addition of an adviser in agricultural engineering is an entirely new departure in staffing arrangements. It is already apparent that this officer will provide a most useful service for land-owners.

A conference of officers of the soil conservation section was held in Toowoomba in June 1953 and all officers benefited from the excellent discussion of technical matters and the general exchange of views. Soil conservation officers also provided technical instruction for a State-wide Junior Farmers' Soil Conservation School which was held over a period of two weeks at the Queensland Agricultural High School and College in January 1954.

FIELD CROPS.

Crop production in Queensland fluctuates markedly from season to season, for reasons which may be either climatic or economic. Throughout the main agricultural districts the rainfall is notoriously variable, with consequent upsets to any planned cropping economy. The vagaries of rainfall can be countered to some extent, and have been countered very effectively in some districts for a number of years, by dry-farming methods on suitable soils.

A second factor which helps to overcome the disabilities of an erratic rainfall is the fact that if winter crops cannot be planted because of failure of rains, then farmers are in the position to use prepared land for summer crops and so switch from winter to summer production, and vice versa. The season under review has afforded typical examples of seasonal irregularity, and of some success which has been achieved in overcoming the difficulties so imposed.

The winter of 1953 was uniformly cold and dry in most agricultural districts of south and central Queensland. However, in spite of the fact that no effective rain fell on wheat lands between early May and the end of August, the State produced a wheat crop which has been exceeded on only four previous occasions.

Spring hailstorms caused some damage to maturing winter crops, but in general the harvest weather was ideal, and good quality grain resulted. Storms at this period gave the Burnett districts the best beginning to a summer season for some years, and enabled crops such as maize, peanuts, sorghum and cotton to be well established by December. On the Darling Downs, however, the spring was generally dry, and early summer plantings experienced unfavourable conditions.

The main feature of the summer weather was the prolonged cyclonic depression of February which caused heavy flooding in many districts but brought much-needed relief to others, such as the Darling Downs. However, the winds caused heavy damage to maize in coastal and Burnett districts, and flooding was responsible for serious crop losses in lucerne, pumpkins, potatoes, irrigated cotton and other crops on lowlying land. Peanuts and grain sorghum were most favoured by the summer rains and should yield much better than has been the case in recent years.

Except in coastal and northern districts the autumn has been generally dry, affording good conditions for the harvest of summer crops. However, summer-autumn rainfall on the Darling Downs was generally insufficient to provide the necessary stored moisture for the 1954 wheat crop, and conditions in June are such that general falls of one to two inches are required before widespread planting can be considered.

The season has thus been one of disappointments, but of some very worthwhile achievements under such conditions. Twelve months ago, a record wheat planting for 1953 was confidently anticipated; this record did not materialise, but a good crop was obtained from a much reduced acreage. In view of the considerable areas of fallow land not used for winter crops, record summer production was anticipated. However, even this was not realised, largely due to insufficient rain on portions of the Darling Downs and to excessive rain and destructive wind elsewhere in the State.

Details of some of the more important crops follow.

Wheat.

The achievement of a 10-million bushel wheat crop in a season in which no effective rain was received between the first week in May and the last week in August is a landmark in Queensland agriculture. It is certain that in a similar season ten or more years ago, comparable results would not have been obtained. This improvement is due partly to the availability of better varieties, but the chief reason is the vastly improved knowledge now available to farmers concerning (i) the best means of utilising moisture stored in fallow soils, and (ii) the best use of the better varieties available.

In general, throughout the Darling Downs the May-planted crop provided the heaviest yields. This crop matured in almost six months, while the September-planted crops ripened in a little over three months. It is estimated that approximately half the total acreage was planted at each planting period, but that the May-planted crop produced about two-thirds of the total harvest, as against one-third for the September crop,

While the slower maturing varieties such as Lawrence and Celebration were ideally suited for the May planting, large areas of the normally quick-growing varieties Spica and Festival were also planted at this time with excellent results. One of the best yields recorded from the central Downs was 55 bus. per acre from 180 acres of May-planted Spica at Bongeem; 12 acres of Festival sown on this farm at the same time yielded 48 bus. per acre.

Although the late plantings were generally much lower yielding than the early, it was the success of these September plantings under hot, dry spring conditions which was one of the most interesting features of the season. In the better favoured areas, these crops were subjected to severe attacks of stem-rust and leaf-rust. While rust completely destroyed a number of late-planted crops of susceptible varieties, highly resistant varieties such as Spica and Festival were able to provide useful yields of 15-20 bus. of prime grain per acre.

While the three months June to August were uniformly cold, little frost damage was reported for wheat. This bears out previous observations that frost damage is usually more severe in a relatively mild winter than in a continuously cold season. It is the periods of sharp frost following periods of warmer weather which cause such damage to growing crops.

Extremely dry conditions at Hermitage Regional Experiment Station prevented the planting of the normal wheat breeding block. However, further progress was possible in the back-crossing programme, which is designed to introduce rust resistance into a number of susceptible but otherwise valuable varieties. One such back-cross involving Puora has now reached the stage at which self-pollination will be carried out to purify and fix the rust-resistant Puora which has been developed. A full complement of varietal and strain trials was carried out on the Downs and in other southern districts. One of the highlights of this testing programme has been the continued good performance of a number of as yet unnamed hybrids resulting from the breeding programme. The majority of these selections are highly resistant to prevalent forms of stem-rust, and are being carefully scrutinised for flour quality before being recommended for release.

Fig. 1 shows the percentages of the State's total wheat area occupied by five of the leading varieties in each of the five seasons 1949-1953 inclusive; the progress made by the Department's new releases, Lawrence and Spica, is clearly shown.

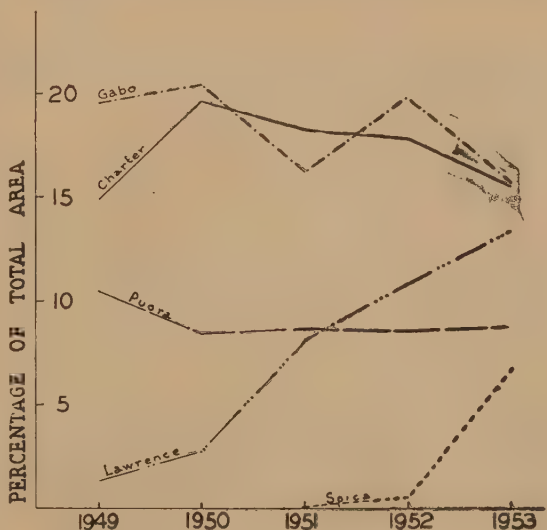


Fig. 1.

WHEAT VARIETAL ACREAGE TRENDS, 1949-53.

Maize.

In contrast with recent years, the maize season commenced well in 1953, particularly in the South Burnett and adjacent districts. February's cyclonic weather, however, ruined all prospects of an exceptional yield. Major damage was caused by the lodging and breaking of stalks, with the result that ears have had to develop in close contact with the ground or with heavy weed growth. A high percentage of loss from

cob-rots and from insect damage is therefore anticipated. On the Atherton Tableland the wet season has been prolonged, and as a result a considerable incidence of cob-rots is also anticipated there.

From the varietal point of view, main interest has centred in the extended use of hybrids. Queensland hybrids were initially tested and recommended solely for areas in the south-eastern corner of the State. However, as varietal testing is pushed further north towards Central Queensland, so do some of the more adaptable hybrids still exhibit higher yield capacity than the best available open-pollinated varieties. Similar reports have now been received from as far north as the Burdekin. At a trial conducted last year in the Soldier Settlement Area at Clare the yields shown in Table 1 were obtained.

TABLE 1.
YIELD DATA FOR MAIZE VARIETAL TRIAL, CLARE, 1953.

Variety.										Yield.
										Bus. per acre.
Q719..	..	..	..	..	..	..	..	..	..	80.5
Q23..	..	..	..	..	..	..	..	..	..	80.4
Q462..	..	..	..	..	..	..	..	..	..	76.7
Q717..	..	..	..	..	..	..	..	..	..	74.6
Star Leaming	..	..	..	..	..	..	..	..	..	56.6
Atherton Dent	..	..	..	..	..	..	..	..	..	52.5
Durum	..	..	..	..	..	..	..	..	..	51.3

These results strikingly illustrate the yields which can be obtained under irrigation, and show the clear superiority of hybrids over the three open-pollinated varieties. The top farm yield reported last season in this district was 53 bus. per acre from Q692, but such yields should be capable of being doubled with careful attention to requirements of water and plant foods.

During the 1953-54 season a very comprehensive series of hybrid varietal trials was established in districts ranging from Mareeba and the Atherton Tableland to the New South Wales border. Approximately a third of these trials have been lost through seasonal hazards, but the remainder should still provide excellent material on which to base recommendations for the whole of the State. Yield data have not yet been completed from any of these trials, but three important observations have so far been made concerning DS and NEH hybrids (from the New England Tableland of New South Wales):—(1) that they are normally quicker maturing than any of the Q hybrids; (2) that they are mainly deficient in husk covering; and (3) that on the Atherton Tableland they have been outstandingly susceptible to yellow stripe disease and unable to stand up to the wet conditions generally.

It is not yet evident whether the available hybrids will prove adaptable to Atherton Tableland conditions. Present indications in the Mareeba district, however, are that this area may soon be almost entirely devoted to hybrids based upon Gatton inbreds.

Sorghum and Sudan Grass.

The 1953-54 season generally favoured sorghum rather than maize. On the eastern Downs many crop failures occurred, but further west the seasons were more favourable, and on fallowed soils some remarkably good yields were obtained. In the Burnett districts and Callide and Dawson Valleys, seasonal rains generally favoured the crop, and far less wind damage was sustained than with maize. In all districts, however, late-maturing crops were subjected to heavy midge attacks, and serious loss occurred from this cause.

The sorghum breeding programme is still centred at Kingaroy, but a subsidiary breeding and testing centre has been re-established at Biloela Regional Experiment Station. In a strain trial carried out in the South Burnett this season, seven out of 14 hybrid selections exceeded the standard variety. Wheatland in yield; top yield (for a Day Milo x Dwarf Kalo progeny) was 32.5 bus. per acre, compared with 22 bus. per acre for Wheatland. A new project in the breeding programme is a cross between Martin grain sorghum and Atlas sweet sorghum, designed to produce a dwarf grain sorghum with sweet, palatable stalk and leaf. In making selections from the hybrid generations of this cross, refractometer tests are being used as a guide to high sugar content.

In Sudan grass, selection for low prussic acid content combined with high yield and palatability is being continued. During the year the new variety Sweet Sudan grass has been made available through the Seed Certification scheme. Grazing trials carried out during the

season have all indicated a higher grazing preference for Sweet than for Roma, with commercial seed stocks inferior to both.

In a Sudan grass varietal planting in the Redlands district, yield totals of well over 20 tons of green matter per acre have been obtained over four cutting periods in the one summer season. The outstanding variety in this test was the new American introduction Tift (36 tons per acre), which outyielded strains of Roma and Sweet Sudan and proved markedly superior to them in freedom from leaf blight and other leaf diseases. These characteristics, if maintained, could well enable this variety to be a most useful fodder crop in coastal districts.

Oats.

The winter season of 1953 was a most unfavourable one for grazing crops, particularly oats. Most crops which were successfully established prior to the winter drought made little growth during the cold months and lacked rain to induce crown-rooting. Because of the restricted root development many fair crops could not be grazed during the main winter months, or if grazed, were largely destroyed.

In such a dry season, crops were little troubled by either crown-rust or Victoria blight. In the main grazing trial in the Gympie district, nine varieties averaged 281 cow-grazing hours per acre, compared with averages of 492 and 532 cow-hours per acre for the 1950 and 1952 trials respectively.

One of the main features emerging from the 1953 season and the commencement of the 1954 season is the appearance of a new form of crown-rust which can attack Vicland, Fultex and the so-called "Bligh" oats. As these varieties are also susceptible to Victoria blight, their period of usefulness as grazing oats would now appear to be finished. In their place the Department has released BVH 4709 under the registered name of Bovah. This variety has been shown to produce well over a period of years, and has in the field proved highly resistant to prevalent forms of crown-rust as well as to Victoria blight.

Barley.

Barley is a winter crop which has not received much attention in Queensland in the past. It has always been regarded as a minor grazing and feed-grain crop, but over two million bushels of grain were produced in the 1952 season and about one million bushels in 1953.

It is generally conceded that a high protein percentage is a disadvantage in a barley intended for malting, and for this reason Queensland (which produces the highest protein wheat in Australia) has never been seriously considered as a producer of malting barley. Within recent years, however, local brewing interests have definitely widened the market for Queensland malting grain, and this development has revealed a rather unsatisfactory varietal position. Unsuccessful attempts have been made by the industry to import bulk lots of improved varietal stocks from southern Australia. However, small pure-seed samples of such malting varieties as Prior, Malt-worthy, Research, Chevalier and Proctor have now been imported by the Department for increase and testing. Should any of these pure strains exhibit superior yield or quality to the commercial varieties in current use, general increase and liberation to farmers will follow.

Linseed.

As predicted last year, linseed almost disappeared from the agricultural scene, as a result mainly of a greatly reduced price differential between linseed and wheat. This year a rise in the price of linseed to approximately £70 per ton, coupled with a general weakening of grain markets, has again engendered interest in this crop. An area of 20,000-30,000 acres was confidently anticipated for the current season, but the failure of the autumn rains in grain growing districts will seriously retard this rehabilitation of the crop.

An unfavourable winter drastically curtailed any experimental work with the crop last season. The varietal testing programme, which has already indicated that a number of selections may be capable of higher yields than the commercial variety Walsh, will proceed as soon as weather conditions allow.

Tobacco.

The tobacco industry generally has had a most successful year. Record prices (up to 210d. per lb.) were obtained for leaf at Mareeba sales this year, and the first sale of southern leaf was also highly successful.

averaging more than 10s. per lb. At both Mareeba and Brisbane sales over 90% of the leaf submitted was sold. The improved quality all round has been attributed to a generally favourable season, the use of grassland in the lower Burdekin, the use of fertilizer mixtures of lower nitrogen content, better insecticidal programmes, and, in the south-west, the widespread use of good flue-cured varieties.

Increased use of oil-burners for curing is reported, and results have generally been satisfactory. The relatively high capital cost is offset by the semi-automatic operation which reduces the labour required for curing.

Seed sales for the year indicated that for the first time in over 15 years Gold Dollar has been displaced from its leading position in the State. Hicks proved the most popular variety last season, followed closely by Gold Dollar, with the new variety Virginia Gold in third place. Seed plots of Hicks and Virginia Gold have provided good harvests of 2,466 oz. and 569 oz. respectively, and a partly harvested Gold Dollar plot should replenish stocks of this variety to the extent of 500-800 oz.

Other work on tobacco is discussed under the heading of "Tobacco Experiment Stations."

Cotton.

Final figures for the 1952-53 season showed a production of 4,229 bales of lint from an area of 10,082 acres. The total yield of seed cotton, 2,421.6 tons, was the highest since 1944. The mean yield of 538 lb. of seed cotton per acre is the highest for 20 years, and the lint percentage of 38.12 is the highest ever.

With the continuation of the guaranteed home price for raw cotton, the 1953-54 season opened well in most districts. The February flood rains, however, caused widespread damage and reduced the effective acreage to below that of the previous year. In the Theodore area alone, 400 acres of irrigated cotton were completely destroyed.

Investigational work covered varietal trials, strain trials of jassid-resistant selections, time-of-planting studies under irrigation, and a continuation of the progeny selection programme. The combined varietal and time-of-planting trial on the Burdekin generally confirmed previous seasons' results. Coker 100 again showed its superiority in yield over all other varieties tested, with seed cotton yields ranging from 1,500 to 1,700 lb. per acre. While this variety has been the outstanding producer under irrigation conditions in Queensland in recent years, its lint is not well received by the classers, and crossing it with a coarse-fibred cotton like Miller to combine the good characters of both varieties is being considered.

March planting again proved the most suitable for Burdekin conditions. Yields from the April planting were 15% down on the former, while the August planting proved a complete failure.

Improved quality of mechanically harvested cotton has been achieved by more sparing use of spindle lubricant and the more moderate use of water to aid doffing. However, there is still room for improvement in this operation, from the viewpoint of effectiveness of picking as well as of grade of the picked sample.

Cowpeas.

The use of this crop as a grazing and green manure crop in south-eastern Queensland has been greatly limited in recent years by the severity of attack of the stem rot disease. In co-operation with Plant Pathology Section, efforts are being made to relieve the present situation. Among readily available commercial varieties, only Giant has been consistently resistant in field trials; Cristaudo has on occasions withstood heavy attacks, and C.P.I. 9432 and Soutter have also shown partial resistance. Of new introductions tested, Blackeye-5 has shown complete resistance, but appears somewhat inferior agronomically to such varieties as Reeves, Soutter and Poona. The method of attack is therefore to (i) make a rapid increase of Blackeye-5 for general liberation; (ii) try to substitute such hardy crops as mung bean and velvet bean, at least as a temporary expedient; and (iii) as a long range project cross Blackeye-5 with Soutter to breed a more productive resistant variety.

Peanuts.

A near record area of approximately 37,000 acres was sown to peanuts last season. A yield of 19,000 tons is anticipated.

Early plantings in the Kingaroy district matured a small crop of nuts during December, but made new growth during January and February to set a second and heavier crop. Weather conditions were generally good for crops in newer districts such as Coalstoun Lakes, Bundaberg and Biloela districts, and excellent crops were harvested in these areas. The dry autumn weather in southern districts was ideal for harvesting, curing and threshing operations.

Planting rains were late in the Atherton-Mareeba area, and the prolonged wet season which ensued made weed control very difficult. In the higher-rainfall, Tableland section, conditions have remained wet up to and following the harvesting period, with consequent serious loss of nuts in the stook. Favourable conditions existed in the Cooktown area for a planting of some 600 acres.

Mechanisation of the industry is proceeding rapidly, and an appreciable proportion of the crop is now being sun-dried in windrows and harvested by means of pick-up threshers of both local and imported manufacture. Seasonal conditions must play a big part in the success of this change-over, as deterioration in quality from excessive rain will occur much more rapidly in windrows than in stooks. An aspect worthy of consideration now is the pick-up threshing of the crop shortly after windrowing, to be followed by artificial drying of the nuts; such an operation should result in a much more uniform product of better overall quality.

Potatoes.

In the Fassifern, Lockyer and Brisbane Valleys, where approximately 80% of the State's crop is grown, autumn plantings experienced their worst season for many years. Extensive areas were ruined by the February floods and the excessive waterlogging of soils generally. Replantings made after the flood weather were somewhat late, and therefore subject to winter frost damage. Approximately 4,000 acres were eventually established, this area being 1,000 acres less than that harvested the previous autumn. The most popular varieties this season were Sebago and Exton.

In a varietal trial carried out at the Irrigation Research Station at Gatton, Sebago produced 6.62 tons and Factor 5.63 tons of marketable tubers per acre; these two varieties significantly outyielded Monak, Exton, Adina, Pink-Eye and Moona.

Bismark was the principal variety grown at the Clare Irrigation Area, on the Burdekin. Yields in this district averaged 4.5 tons per acre. Variable seed quality and late arrival of seed are drawbacks to production on the Burdekin.

Onions.

Yields of 8-10 tons per acre were obtained from the 1953 crop and good prices resulted in satisfactory returns. Growing conditions were very favourable, with less disease than is normally experienced. Seed crops also produced well, and as a result the price of local seed (£3-£5 per lb.) was considerably lower than in recent years.

Lucerne.

Irrigated lucerne from the Lockyer and Fassifern districts has continued to supply the Queensland market with the bulk of its high-quality hay. Yields of 6.7 tons per acre per annum are being realised in these districts.

Increasing interest is being shown in lucerne, both as a pasture component with Rhodes grass and green panic, and as a row crop for grazing in the 20-30 in. rainfall belt. In the Wandoan area there are now about 4,000 acres of lucerne, half of which is grown as a row crop. Owing to its perennial nature and high fodder value, lucerne should be grown by all stock-owners in districts with suitable soils and with an average annual rainfall exceeding 20 in.

PASTURES.

Stock-owners throughout the State maintained keen interest in all phases of pasture improvement during the year. Largely as a result of this interest some 150 pasture trials have been established over a wide area from Cape York Peninsula to the southern border, in co-operation with graziers and dairy farmers.

Investigations into dairy pastures problems have been financed in part by a grant from the Australian Dairy Produce Board, and there were 125 dairy pasture trials in progress during the year. The results obtained from grazing trials laid down on co-operators' properties have

stimulated considerable farmer interest in the Mary, Brisbane and Fassifern Valleys, and on parts of the Darling Downs, and practices which have proved themselves in trials are being adopted on a commercial scale.

The interest in sown pastures resulted in increased demands for seed and led to the bulk importation of seed of buffel grass (*Cenchrus ciliaris*) from Western Australia and of the tropical legume centro (*Centrosema pubescens*) from Malaya. In view of the demand for seed of phasey bean (*Phaseolus lathyroides*), techniques for the mechanical harvesting of this seed were studied. Seed supplies of other important Queensland pasture species are available commercially. Seed production of serobic (*Paspalum serobiculatum*) may soon be commercialised, but there is still a need for large-scale production of seed of stylo (*Stylosanthes gracilis*).

Information obtained during the year has confirmed the opinion that buffel grass offers outstanding promise as a pasture species on many of the so-called desert soils of the central-west and on the harder types of country in the north-west. Green panic increased in popularity in many parts of the State. Reports from the northern Darling Downs, the lower, central and upper Burnett, the Fassifern and Brisbane Valleys and the Rockhampton district state that this grass is valued because of its palatability, its rapid and bulky growth, and its ability to suppress weeds.

Trials have shown that, contrary to general belief, molasses grass will persist for many years under grazing, provided it is stocked intermittently and protected from fire. The ability of this grass to colonise poorer soils and compete with weeds in the higher rainfall areas of south-eastern Queensland warrants wider use of it.

Useful indications in the pasture legume problem in south-eastern Queensland included the good growth of Townsville lucerne in trials in coastal and sub-coastal areas south of Bundaberg to Brisbane, and also in the Fassifern, and Lockyer Valleys; the vigorous regeneration and development of centro and stylo for three years on sandstone-derived soils at Moggill was also impressive.

Phasey bean continued to show promise as a pasture legume in areas with a minimum annual rainfall as low as 22 in., but unfortunately it suffers serious damage from bean fly attack when grown on parts of the south-eastern coastal district.

Barrel medic (*Medicago tribuloides*) is a self-regenerating annual winter legume which because of its drought resistance offers promise in parts of southern Queensland. It is growing well in the Guluguba and Taroom districts.

Isolation by an officer of the Plant Pathology section of effective strains of *Rhizobium* for red and white clovers resulted in vigorous growth of these legumes on sandy loams and podzolised soils in south-eastern Queensland where clover growth had previously been disappointing. A complicating factor in the successful regeneration of clovers on sandy soils is severe nematode attack, which destroyed regrowth at Moggill in the autumn of 1954.

Interest by stock-owners in irrigated pastures was maintained. In some cases pasture establishment was not satisfactory. It was shown that the major difficulties in obtaining good establishment were associated with inadequate land preparation. To achieve success irrigated pastures must be treated as a specialised crop requiring efficient cultivation involving pre-cropping.

In order to facilitate land preparation for irrigated pastures, units, each comprising a Johns leveller, a crowder and a delver, have been provided for loan to farmers.

Officers of the Agriculture Branch are co-operating with other Branches in a number of projects. These include the field testing of new rhizobial cultures on the Atherton Tableland and at Redland Bay; a study of copper deficient pastures at Mooloolah; pasture establishment on the wallum country at Coolumb and the Blunder; Rhodes grass-lucerne mixtures on brigalow soils at Inglewood, Kingaroy and Biloela; and the effect of mowing at different stages of growth on the yield and botanical composition of Mitchell grass-Flinders grass pastures in north-western Queensland.

Exploratory Plots.

Forty pasture species plots are now established in the State, including nine on different soil types in Cape York Peninsula. Information is to be obtained on persistence and aggressiveness of the species,

Pasture plots continue to reveal differences in agronomic characters between strains of green panic and of buffel grass. At least two strains of buffel grass are now on the market and considerable differences exist between them. One strain was developed under Western Australian conditions and the other in the Burnett Valley in Queensland. Both strains seem promising for the drier portions of the State but the Queensland strain is superior in the 20-35 in. rainfall zone. The taxonomic and agronomic characters of these strains are being studied.

Makarikari grass (*Panicum coloratum* var. *makarikariensis*) has grown well on red-brown scrub soils in the Crow's Nest district and is palatable to stock. This grass offers promise for protecting waterways.

Indications are that on sandy soils and dark red loams in the Goondiwindi district, *Urochloa mosambicensis*, together with buffel grass, green panic and phasey bean, will prove useful for summer pastures.

Fertilizer Trials.

Marked responses to a fertilizer containing 10.25% nitrogen and 10.75% phosphoric acid were obtained in a paspalum pasture hay yield trial on a light yellow-brown loam soil in the Gympie district, in which two summer cuts were made following topdressing in the spring of 1953. The results are shown in Table 2.

TABLE 2.
PASPALUM HAY TRIAL.

Treatment.	Control.	N.P. Fertilizer (10.25 : 10.75)		
		160 Lb./ac.	320 Lb./ac.	480 Lb./ac.
Hay Yields (lb./ac.)	2,326	3,382	4,713	5,179
Increase over Control (lb./ac.)	..	1,056	2,387	2,853
Costs per Acre	..	s. d. 40 6	s. d. 81 0	s. d. 121 6

On these results, which in the main corroborate those obtained in the previous season, the most efficient increase in yield of good quality hay is given by 320 lb. of the fertilizer per acre, at which level an increase of 21 cwt. of hay costs 81s. for fertilizer.

A delay of 15 months in the response of pastures to lime and superphosphate has been noted in two trials. At Maleny, paspalum-kikuyu pastures growing on a deep red clay loam, and at Mooloolah, paspalum-narrow-leaf carpet grass (*Axonopus affinis*) pastures on grey alluvial soils, showed delayed but spectacular increases in white clover growth following treatment with 1 ton of lime and 2 cwt. of superphosphate per acre. At Mooloolah, clover population increased from approximately 8% to 30% of the total ground cover. Plots receiving superphosphate and/or various trace elements did not show the same response.

A marked residual effect of topdressing was shown by a kikuyu-white clover pasture on a deep red basaltic soil on Mt. Tamborine. Plots treated in 1951 with 1 ton of dolomite and 3 cwt. of superphosphate per acre, or 3 cwt. of superphosphate alone, continued to show increased vigour in clover growth three years after treatment.

Copper-uptake trials on coastal pastures continue to show that white clover and paspalum have higher copper levels than narrow-leaf carpet grass except for a short period in the growing season when the latter grass has a very high copper peak.

Results of fertilizer and trace elements plots on coastal pastures from Mackay to the border indicate that superphosphate and lime are the major deficiencies in this region. In many cases heavy dressings of superphosphate alone (from 3 to 10 cwt. per acre) will give marked clover response.

These findings are now being applied commercially by farmers on the coast. So far, in only one instance, near Gympie, has an indication been found that the use of a few ounces of molybdenum per acre may reduce the need for heavy lime application.

Grazing Trials.

Pasture grazing trials are successfully demonstrating that improved carrying capacity can be achieved by proper management.

In the Gympie district, 21 acres of improved paspalum pasture on a loam of low fertility (subdivided, contour

furrowed, topdressed with lime at the rate of 2 tons per acre in 1951 and receiving 2 cwt. of a mixed fertilizer (6-75-14-25-0) per acre annually) have provided during 1953-54 41% of the total grazing on the farm, which has an effective area of 80 acres.

At Loamside, near Ipswich, green panic on a grey brown clay loam provided grazing in October one to two weeks earlier than Rhodes grass on the same soil type. Excess growth on these plots was mowed in late summer and green panic again provided much faster regrowth than did Rhodes grass.

In the 13-acre grazing trial at Conondale which in the 1952-53 season produced 32.1 lb. of butterfat per acre more than untreated native pasture supplemented by cultivated fodder crops, the increase in 1953-54 was only 15.7 lb. butterfat per acre.

This smaller increase is explained by the fact that the co-operator, influenced by the success of the work, had developed a large area of improved pastures. An accurate comparison with untreated pasture was therefore not possible and the favourable margin was less pronounced.

Grazing trials with African star grass (*Cynodon plectostachyus*) at Rockhampton and Biloela Regional Experiment Station were completed. Hungry stock grazed heavily on this grass without ill effects. Therefore it appears unnecessary to maintain a ban on the propagation and distribution of this species.

Pasture Conservation.

Conservation of excess pasture growth is receiving increasing attention. Pasture hay has been baled in north-western Queensland, the central highlands, and the districts of Rockhampton, Gympie, Beaudesert and Boonah. Wedge silos were constructed with buck-rakes on the Atherton Tableland using kikuyu, in the Gympie district using lucerne, and on the Coomera from paspalum and lucerne. The test of the method will come when the silos are opened up in 1954-55.

Irrigated Pastures.

Irrigated pasture production has generally been high. Recovery in growth following overgrazing in summer and waterlogging or partial flooding in February was good, and highly productive pastures are assured for the critical late winter, spring and early summer months of 1954. On the other hand, seasonal conditions have not been favourable for the establishment of new pastures in 1954 because light autumn and winter rains necessitated a considerable number of irrigations. Late plantings on hastily prepared seedbeds suffered severely from lack of available nitrogen, a condition which was accentuated by over-watering.

Water shortage during stress periods is limiting the areas sown to irrigated pastures on many farms, and increasing attention is being given to the development of underground water supplies and also to conservation of water in dams.

In southern Queensland the most productive mixture has been:—White clover 2 lb.; red clover 1 lb. (or lucerne $\frac{1}{2}$ lb.); H.L. ryegrass 4 lb.; phalaris 3 lb.; cocksfoot 2 lb. per acre. Paspalum is oversown at 6 lb. per acre. It is estimated that some 800 acres of this type of mixture are now in production.

In the lower Burdekin area, mixtures such as para and centro, and guinea grass and centro, are being laid down in commercial plantings.

"BRIAN PASTURES" RESEARCH STATION.

Investigations into the problems associated with beef cattle pastures have commenced on the new "Brian Pastures" Research Station at Gayndah.

The control of eucalypt regrowth is a major problem on many grazing properties in central coastal Queensland, and trials have been initiated in co-operation with the Botany Section to test the effect of 11 hormone formulations at different stages of seasonal growth. Treatment of saplings and trees involves brushing or frilling, depending on trunk size, followed by swabbing with the hormone preparations. Small regrowth is treated by foliage spraying.

A grazing trial on self-mulching dark-brown clay soil, covering 60 acres of sown pastures and 15 acres of reserve pasture, is in course of establishment. The purpose is to test Rhodes, green panic and buffel grasses when each is grown in a mixture with lucerne and phasey bean and to compare these sown pastures with the adjoining native pasture of black spear grass

(*Heteropogon contortus*), forest blue grass (*Bothriochloa intermedia*), and Queensland blue grass (*Dichanthium sericeum*).

Management of the sown pastures will be on a rotational basis and five 4-acre plots of each mixture will be used. Forty-one acres, including 3 complete replications, and two of the four reserve paddocks have been established. The remainder will be planted in the coming spring.

Land has also been prepared for the spring planting of nursery plots of introduced pasture species for seed increase, and the establishment of small sward plots to test new species for yield, persistence and palatability.

FODDER CONSERVATION.

Interest in fodder conservation has increased but the quantity of fodder conserved per head of livestock in Queensland is far from satisfactory.

The introduction of the buckrake has made the storage of fodder reserves an economic possibility for even the small farmer. This implement is likely to promote fodder conservation on a wider scale. It can be used to advantage by both the small dairy farmer with less than 20 cows and the grazier with a few hundred head. The steadily increasing use of automatic pick-up balers for conserving surplus fodder or pasture as baled hay is also encouraging.

At least two co-operative fodder conservation machinery pools operated satisfactorily during the past season.

In general, there is a tendency to store fodder as silage. Long-term storage is best effected in tower, pit, or trench silos. Short-term storage is readily achieved in wedge or bun silos, which are simple to build and require less labour during feeding-out. Such silos can be made of surplus pasture or fodder from the wet season for use in the lean period of early spring, provided, of course, that material is ensiled at the proper stage and is of a suitable kind. Wedges and bun silos are, however, wasteful for long-term storage compared with effectively confined ensilages.

SOIL CONSERVATION.

The progress of soil conservation in the State was marked by a number of special features. These are:—

(1) The initiation of the State's first group conservation project—the Boobie Road project in the Kingaroy district.

This scheme involves the co-operative action of all the landholders in a catchment area of approximately 4,000 acres towards obtaining the most efficient control of drainage in the area, and embraces a group of 23 farms. The project was planned at the request of the farmers concerned and is being executed as an agricultural drainage project under the Local Government Act. It is the forerunner of a number of similar projects now in course of preparation.

(2) The growing practice of conserving crop residues as a surface mulch on the Darling Downs.

This follows recognition by farmers of the value of a protective soil cover for mitigating erosion. The main disadvantage to universal adoption of the practice has been the unsuitability of agricultural equipment for handling the trash. Manufacturers, however, are aware of this problem and new and better types of agricultural machinery for this purpose are being developed.

(3) The advent of chisel ploughs and the wide use of modified tined implements for cultivating the soil with a corresponding decrease in the use of disc implements.

The great advantage of these new tools is that they permit cultivation with a maximum retention of crop residues on the soil surface. Since they cultivate with a minimum disturbance of the soil they have a minimum deleterious effect on soil structure and can be operated to work at greater depths than orthodox types of ploughs. The result is better infiltration of water, reduced runoff and less soil erosion.

(4) The rapidly mounting interest in the use of improved pastures as a phase of a rotational cropping programme.

This development is of special importance since it is this phase of the rotation which is of most significance from the conservation aspect.

(5) The changing attitude of farmers towards soil conservation.

In the first five years of the more intense soil conservation activities of the Department, farmers were hesitant to adopt the new techniques recommended for the protection of their soil. Many of the earlier co-operators doubted the effectiveness of conservation measures. However, successful example has had its effect, and this year the change in farmer reaction has been very noticeable. There is now a widespread acceptance of the necessity for conservation practices, and a keen demand for Departmental assistance.

Weather Conditions and Soil Erosion.

Rainfalls in the agricultural areas of the State for most months of the year were comparatively light and aggregates generally below average. Abnormally high falls were recorded in February in all areas except the far north. These falls were not of high intensities except in the coastal areas and part of the eastern Darling Downs.

On the Darling Downs, steady general rain fell early in February and saturated the soil to a foot or so. This was followed by some intense falls on the eastern perimeter of the district, and serious soil erosion was caused in a number of widely separated districts, particularly on bare arable land in seedbed condition. Drainage structures under these conditions were of value only to the extent that they intercepted and diverted runoff; they did not stop inter-bank soil movement and consequent channel siltation. In contrast, both cover crops and stubble residues proved very efficient in preventing erosion during this period.

The February rains caused some sheet and gully erosion in the Granite Belt, mostly in the northern sector, where rainfalls were heavier.

Flood water caused loss of much topsoil from alluvial flats in the Fassifern Valley and Beadesert districts, especially from potato fields.

On the Atherton Tableland, a series of light falls in March was followed by heavy falls in April which caused some severe erosion in peanut areas. In other places, crop cover was sufficiently dense to protect the soil effectively.

In the southern sugar-cane areas the general change-over from autumn to spring planting of cane assisted considerably in reducing the erosion potential in February because of the protective canopy provided by the spring planted cane.

Extension Activities.

The conservation of the soil in a fertile and productive state is basically a matter of wise land use. Farmers are encouraged to approach their conservation problems with this basic idea in mind, and the activities of extension officers of the Branch are being integrated to foster this principle. On the Darling Downs, for example, where the erosion problem is particularly severe, the former tendency of many farmers to attach undue importance to surface drainage control systems as a means of controlling erosion is being suppressed, and increasing recognition is now being given by them to the necessity for rectifying farming malpractices.

Another development of the changed attitude of many farmers towards the erosion problem is the greater tendency to apply control measures before erosion becomes manifest. During the early post-war years, the majority of requests for assistance in implementing erosion control measures were from farmers faced with a problem of reclaiming land already severely eroded. Few, at that time, appeared to be particularly concerned with thoughts of prevention. While this general attitude still exists to some extent, many property owners concerned with the security of their rural assets are now thinking and acting in terms of prevention instead of control.

The continued trend towards improved agronomic practices with a view to mitigating erosion and improving the productivity of the soil is particularly evident in the Darling Downs and South Burnett districts. Farmers are reducing the number and frequency of tillage operations and making more general use of crop residues as a protective surface mulch. Many are using pastures, either in rotation with, or in replacement of, cash crops and annual forage crops.

On the Darling Downs, Rhodes grass and green panic appear to be the most promising of the summer grass species, and *Phalaris tuberosa* the best of the winter species. Lucerne has so far proved to be the most reliable legume, although red clover has given particularly promising results in some trials. In the South Burnett, Rhodes

grass is popular as a short-term pasture species, and green panic and buffel grasses as components of long-term and permanent pastures.

On the Atherton Tableland, the adoption of pasture rotation in the cropping programme is developing more slowly than elsewhere and monoculture is still the general practice there. Nevertheless, a few maize farmers are experimenting with pastures.

Kikuyu grass has shown outstanding advantages as a waterway grass. It forms a closely matted cover that will carry higher water velocities than is possible with other grasses. It is also a particularly good species for use in the reclamation of eroded gullies and in stabilising overfalls.

Mechanical measures of soil erosion control were again set out on a large area, and advice and technical assistance in relation to the construction of earthworks occupied the major part of extension duties. The total area protected from accelerated erosion during the year by bank structures is estimated to be approximately 10,000 acres, bringing the estimated total area for the State to between 40,000 and 50,000 acres.

The number of dozer unit attachments on farm tractors has shown a steady increase, and this implement is displacing ditchers and other light graders as the most favoured tool for the construction of banks. This trend has been largely influenced by Departmental recommendations. It is estimated that more than a hundred of these units are in use on the Downs.

Private contractors are entering into the field of soil conservation and doing earth moving work at prices ranging from £3 10s. to £7 an hour according to the size of the plant. About six units are operating on the Downs. The work done by these contractors is usually in accordance with plans prepared at the farmer's request by Departmental officers. Because of limited staff, it is not possible to attend to all requests immediately, and consequently, some drainage structures are being erected by contractors in accordance with the independent instructions of property owners.

Various Shire Councils have assisted farmers with the hire of machinery for earthwork construction. Practically all work performed with Shire plant is under the direct supervision of the Department.

Catchment Planning.

The problem of soil erosion can be handled most efficiently when considered on a whole watershed basis. Accordingly, a policy of planning drainage control of catchment areas has been adopted and further developed during the year. The two main areas in which this work has proceeded are the South Burnett and the Atherton Tableland.

In the South Burnett, where the Booie Road catchment project is about to be initiated with the co-operation of the local Shire Council, the contour plans are nearly complete for another proposed project—the Wooroolin Swamp catchment of approximately 7,000 acres. Contour plans have been started also for the Memerambi catchment of about 8,000 acres.

With respect to the Atherton Tableland, the Halloran's Hill-Cairns Road catchment plan was finished during the year, and a tentative control plan for the 8,000 acres of the Bones Knob-Mapee catchment has been prepared and will shortly be submitted for critical examination to other interested Departments.

While planning on a catchment basis may not be as imperative on the Darling Downs as in other places because of the better delineation of drainage lines, this aspect cannot be neglected. The control of one catchment in the Pittsworth district has already been planned and partly implemented.

Investigations and Research.

There was no significant difference in yield of grain between mulched and unmulched areas in the 1952-53 maize stubble mulch trial at the Kairi Regional Experiment Station. The mean yield was 28.3 bus. per acre. It was shown that sweep implements will cultivate satisfactorily through maize stubble if the stubble is cut into short lengths by some prior treatment, and cutaway disc harrows have so far proved the best implement for this purpose. The overall conclusions from this trial are that land can be prepared and maize grown satisfactorily under stubble, but every operation needs care and is not as straightforward as with clean cultivated areas.

Runoff measurements in the land use trial at Kairi showed that flow was greatest from the freshly ploughed plots. The next highest runoff was from a plot containing a thin stand of tussocky grass, followed next by freshly mown lucerne. Runoff was very slight from plots containing a mature stand of maize and weeds.

The pluviograph on the Hermitage Regional Experiment Station recorded two falls during the year in which intensities approached 4 inches per hour over a 15-minute period, and more than 2 inches per hour over a 30-minute period. Such intensities are always likely to cause serious erosion on the Darling Downs.

For the third year in succession at Hermitage, the deep ploughing treatment on soil with a comparatively shallow profile gave a better yield of wheat (17.3 bus./acre) than either the normal undercutting (9.24 bus./acre) or the stubble mulch treatment (8.95 bus./acre). The generally low yields were due to the dry conditions which prevailed during the season.

A second trial to compare the effects of different cultural treatments has now been set out on a deeper soil type more typical of the wheat-producing soils of the Darling Downs.

Nitrate studies made in the early planted wheat crop towards the end of the season revealed that the nitrate status of the top six inches of soil under crop was nearly as high as in fallow land (17 and 21 ppm respectively). This is a particularly interesting observation and suggests that stored nitrogen which is not leached when the latter end of the wheat season is dry may be a major beneficial influence in the good quality of grain produced under these conditions.

AGRICULTURAL MACHINERY.

During the year there was considerable improvement in the availability of all types of agricultural machinery but there are still some deficiencies in respect of special equipment. This applies particularly to the peanut industry, where high labour costs involved in stooking have created a considerable demand for the engine-functioned pick-up thresher.

Amongst the new machinery which is being brought to the attention of Queensland farmers, the buckrake and sod-seeder are worthy of special mention. The former is a very efficient unit for collecting mown plant material and conveying it speedily to the site chosen for a silage storage. It possesses many advantages for making silage and should be a very useful implement for stock-owners, especially dairymen.

The sod-seeder has received wide publicity following work on pasture improvement in northern New South Wales by a special team of Sydney University researchers. The machine is designed to sow seed in established pasture but it is too early at this stage to judge how efficient sod-seeding machinery at present available will be under Queensland conditions.

During the year advice and information on equipment was supplied to primary producers and also to Departmental committees engaged in various agricultural projects. In order to obtain baled bush hay of a higher nutritive value, operations were speeded up in a Departmental bush hay conservation project by the design and construction of a special draw-bar enabling the ganging of an additional mower and a side-delivery rake. Cutting and raking were thus combined into one operation with the unit capable of working an average of 20 acres per day.

Closer liaison has been established with manufacturers and distributors of agricultural machinery. This has been useful, not only in regard to information on supply and demand of agricultural equipment, but also in respect of likely trends in the various fields of mechanised agriculture.

BUREAU OF TROPICAL AGRICULTURE.

Pastures.

The rotational grazing trial was maintained for the eighth year. The stocking rate was increased in September and has been kept at nearly a beast to the acre, with the animals gaining 1.28 lb. per day. The productivity of the two 2-acre fields of each of four mixtures has continued, but there has been some invasion by other species. This year, the green bulk of each original component and of the principal invaders was estimated.

Guinea grass and stylo produced about 70% and 5% respectively of the grazing in both replications. The invaders were mainly para grass and centro in one field and *Brachiaria decumbens* and centro in the other.

Purple-top guinea and centro produced 50% and 30% and 45% and 30% respectively of the grazing in the two replications. The invaders were mainly summer grass (*Digitaria* sp.) in the first field and coarse guinea grass (*Panicum maximum* of several strains) in the other.

Molasses grass and puero have fared badly as a mixture, after showing promise in the early years. From one field the grass has gone and puero comprises 80% of the grazing. The main invaders are para grass and *B. decumbens*. In the second field molasses grass produced 10%, puero 10% and invaders, mainly para grass, 80% of the available feed.

Molasses grass and calopo in one field produced 55% and 5% respectively of the bulk, and invaders, mainly centro, 40%. Calopo has gone from the other field and molasses grass formed 70% of the pasture, puero being the main invader.

Brachiaria decumbens cut every 30, 60 and 90 days this year has carried 8.6%, 6.9% and 5.1% of protein respectively in air-dried samples. This grass appears inferior to para, guinea and molasses grasses. Green panic and *Glycine javanica* did not make a good pasture. The legume failed and the grass was unthrifty under moist soil conditions.

At Utechee Creek some of the continuously grazed 4-acre fields have not withstood grazing at a beast to the acre. Continuous stocking at a fixed rate cannot make the best use of pastures under these conditions. There are three grasses—guinea, para and molasses—each sown alone and with centro and stylo, and lastly, guinea and molasses grasses sown together. By March all molasses grass fields were obviously overgrazed and the para grass areas little better. It was necessary to remove some of the stock. Guinea grass continued growing well into the cooler weather. It has proved best for slopes and combines well with centro.

Tea.

The small plantation is now 10 years old. Production is being maintained by fertilizing twice a year with 50 lb. nitrogen as ammonium sulphate, 15 lb. phosphoric acid as superphosphate and 10 lb. potash as muriate, per acre, at each application.

Throughout the year 0.2 acre was hand plucked and 0.2 acre cut by the Tarpen tea cropper. Hand harvesting took about 2 man-hours and the machine about 1 man-hour per pound of dry tea produced. About 1,000 lb. of ungraded dry tea per acre per year can be produced at South Johnstone. There is little appreciable reduction in quality in machine-picked tea compared with hand-plucked tea.

Since the Tarpen tea cropper does not reduce labour to economic levels, the establishment of suitable hedges, comprising three, four and five rows of plants at 1 ft. and 1½ ft. apart, has been completed during the past three years to examine possible improvements in mechanical harvesting of tea. The hedges occupy about 0.4 acre and shade trees (*Albizia moluccana* and *Gliricidia maculata*) have been planted between the hedges 16 ft. apart. Both *Desmodium triflorum* and *D. heterophyllum* have been sown between the hedges to compare their merits as ground cover.

A new tea seed garden has been established with over 100 young trees planted 15 ft. apart on the square.

Rice.

Two varieties were planted in December in ¼-acre plots for seed increase. Growing conditions were good but there was no effective seed increase as very few spikes produced grain. A fertilizer trial failed also. The reasons for sterility have not been determined, but the occurrence confirms previous experience that commercial rice growing in this area would not be without hazards.

Miscellaneous.

Kenaf planted in November and December yielded much more fibre than that planted in January and February. Kenaf and jute both contained increasing percentages of fibre as they neared, reached and passed the normal stage of harvesting. Three strains of recently imported ramie were established in small multiplication plots.

Cowpeas did not develop wilt in a trial designed to test the susceptibility of Cristado, Soutter, Reeves and Poona, but the first and second were more productive than the others. Cowpeas showed no residual effects from phosphates applied last year, nor any differential response to several forms of phosphate applied this year.

TOBACCO EXPERIMENT STATIONS.

Permanent tobacco experiment stations are being established at Parada on the Walsh River, and near Inglewood on Macintyre Brook. The site at Parada has been surveyed and locations of buildings and borders indicated.

Investigations were initiated on the Inglewood station, where basic facilities and buildings already existed. Some alterations and additions were essential to meet experimental requirements and most of these were completed during the year. A wider range of farm machinery was acquired to facilitate tillage and cultural operations.

1952-53 Trials.

Mareeba.—Yields and appraisal values from the varietal trial are shown in Table 3. Yields are slightly lower than for last season, due possibly to late topping.

TABLE 3.
TOBACCO VARIETAL TRIAL, MAREEBA.

Variety	Mean Yield. Cured leaf.	Mean Appraisal Value.
	Lb./ac.	£/ac.
Virginia Gold	1,364	549.6
Bottom Special	1,162	467.2
402	1,069	414.2
Big Jim	952	385.5
Gold Dollar	936	361.8
Yellow Special	849	337.2

Clare.—Results from the fifth year of the rotation trial are presented in Table 4 and confirm previous results that tobacco yields are most satisfactory following non-leguminous crops.

TABLE 4.
TOBACCO CROP ROTATIONS—CLARE.

Treatment.	Yield Cured Leaf.
	Lb./ac.
Tobacco following Maize	1,355
Tobacco following Rhodes Grass	1,324
Tobacco following Peanuts	1,127
Tobacco following Weeds	1,087
Tobacco following Crotalaria	1,068

The night irrigation trial at Clare provided information on the technique of irrigation on Burdekin Fine Sand soil type. Satisfactory disposition of supply and drainage outlets was worked out and a flow rate per furrow of 0.016 cusec was suggested for use.

1953-54 Results.

Mareeba.—Investigations were curtailed slightly as this was the last year of experimental work on the leased farm. Seed plots successfully carried through to harvest included (a) a bulk seed area of Hicks to provide commercial seed, (b) mother-seed plots of seven other Queensland varieties, and (c) five nematode-resistant crosses made available by the New South Wales Department of Agriculture.

A sucker control trial was carried out comparing the effect on yield of suckering by mineral oils and by hand. Three oils were used, but no differences in yield resulted between the two methods or between the oils. Mean yield was over 800 lb. of cured leaf per acre. Oils were applied at topping with special tobacco secateurs designed by the Commonwealth Scientific and Industrial Research Organization. Further investigations are necessary to assess the worth of oil suckering under commercial conditions.

Clare.—The rotational trial was concluded in its sixth year. Two fertilizer trials and a trace element trial were conducted. Complete data are not yet available but the beneficial effect on quality when tobacco follows Rhodes grass was again clearly apparent in the rotation trial. In the fertilizer trials on "old" land, rank growth occurred in the untreated plots as well as in the fertilized plots. It would seem that the problem of improving quality on "old" land in the Clare area is not merely a matter of varying fertilizer mixtures.

In the land-grading trial, "filled" land yielded 1,929 lb. cured leaf per acre, and "graded" land 1,683 lb. cured leaf per acre. Results from this trial indicate that a certain amount of grading is permissible on this Burdekin Fine Sand soil type to facilitate furrow irrigation, provided the graded areas are cover-cropped for at least two years prior to planting tobacco.

Inglewood.—Investigations carried out included three fertilizer trials and a varietal trial. A rotational trial was initiated and a seed plot of Virginia Gold grown. Curing of experimental leaf was successfully completed using kerosene burners. Results of chemical analyses and other data are not yet complete.

GULF EXPLORATORY FARM—WROTHAM PARK.

Observations and data confirmed results obtained in previous seasons. Summer fodder crops can be grown successfully on the heavy clay soils of the area; late plantings are difficult to establish at the end of the wet season; methods of regrassing cultivated land require further study; the procedure of leaving crops stand in the field after maturity, for feeding off in late winter and spring, is wasteful of grain and fodder.

1952-53 Season.

Fodder and grain sorghums left standing in the field deteriorated badly and were finally fed off in late September 1953 by 250 head of cattle. The Flinders grass which had regenerated on some plots and the dried remains of the crops on the 100-acre farm provided good grazing for one month.

1953-54 Season.

Dry hard soil made seedbed preparation difficult. No effective rain fell until two inches in mid-December. Rainfall recorded during the crop growing season was December 443 points, January 1,503 points, February 1,793 points, March 452 points, and April 466 points.

Cultivated Crops.—Planting commenced in dry soil in late December but was completed in moist soil early in January. Heavy rains in January and February waterlogged the land and crop growth was variable, causing yields to be lowered. Weed growth was most prolific in "dry" planted plots.

Application of superphosphate again increased yields of the fodder sorghums. Samples were harvested four months after planting and the yields are shown in Table 5.

TABLE 5.
YIELDS OF FODDER SORGHUMS AT WROTHAM PARK, 1953-54.
(GROWN IN JANUARY-APRIL INCLUSIVE.)

Variety.	Height when cut. (in.)	Mean Yield per Acre. (Green weights.)	
		*Fertilized.	Not Fertilized.
		Tons.	Tons.
Black Amber	104	13.9	10.1
Sugardrip	70	13.4	11.0
Sudan	89	9.1	8.8
Saccharine	63	4.9	4.9

* 112 lb. superphosphate per acre.

Due to damage by birds and wild pigs, few reliable estimates of the grain yield from the grain sorghum varieties, Alpha, Caprock and Hegari, were obtained. Even though yields were low, superphosphate appeared to be beneficial, and in one case of Caprock yield was increased from 10.3 to 12.2 bus. per acre by 112 lb. of superphosphate per acre.

Cristaudo cowpeas showed no response to applications of superphosphate, hyperphosphate and phospal CB. This was in direct contrast to previous years, when superphosphate caused a pronounced growth response. On the other hand, this cowpea again responded to residual phosphates for the third year after application, 7 tons of green material per acre coming from plots which initially had received 3 cwt. of superphosphate per acre.

Pastures.—Buffel grass was the most promising of the introduced grasses, with green panic next in merit. Phasey bean grew well but lucerne again failed. The native legume *Vigna luteola*, which is palatable to stock, made vigorous growth during the summer and is worth encouragement in native pastures.

Land which had been cultivated and then left for three years to return to native pasture species has now developed good stands of Flinders grass, giving yields of over 2 tons of hay per acre. Such high yields of "bush" hay are noteworthy as they point the way to a practical method of increasing the carrying capacity of similar pastoral areas.

REGIONAL EXPERIMENT STATIONS.

Mr. W. G. Wells, Director of Regional Experiment Stations.



Mr. W. G. Wells.

Although irregular climatic conditions at some of the Regional Experiment Stations adversely affected the seasonal programme of investigations, the overall results indicate that further progress was made during the 12 months under review in solving the many problems that are being studied. The most important of the findings at each Station are reported in either the following summaries or the reports of the Branches conducting certain of the investigations. The monthly precipitations for the Stations are presented in Table 1.

TABLE 1.
RAINFALL, 1953-54 SEASON (IN INCHES).

Month.	Hermitage R.E.S.		Biloela R.E.S.		Ayr R.E.S.		Kairi R.E.S.	
	1953-54.	Warwick Means.	1953-54.	Means.	1953-54.	Ayr Means.	1953-54.	Means.
July	12	1.77	..	1.23	01	65	1.42	98
August	1.65	1.41	3.29	61	2.32	53	1.02	1.45
September	03	1.76	..	98	03	1.30	89	72
October	1.22	2.46	2.54	2.02	1.92	91	62	1.96
November	3.46	2.64	4.57	2.88	52	1.79	2.41	3.36
December	83	3.43	6.02	3.29	93	8.91	1.58	1.63
January	2.02	3.72	2.02	4.22	9.28	10.94	6.97	10.29
February	7.02	3.05	8.15	4.85	21.39	10.02	8.96	10.25
March	68	2.59	1.37	2.78	8.19	6.96	4.84	5.72
April	1.45	1.56	64	1.70	7.35	2.39	12.04	5.26
May	35	1.49	85	1.68	0.5	1.08	1.70	1.72
June	1.20	1.84	83	1.76	62	1.33	1.66	1.12
Total	20.03	27.73	29.78	28.01	52.61	41.81	44.02	44.46

HERMITAGE.

The development of this Station has now reached the stage where it is possible to implement experiments which incorporate animals with the normal agricultural programme. Following construction of a piggery the first breeding stock of Berkshire pigs has been purchased while fencing and pasture sowing are being advanced so that a flock of sheep may be run on the Station next year.

The annual rainfall was below the mean for Warwick, the nearest long-term recording station, and was poorly distributed. The preceding June was dry and normal winter sowings in 1953 did not germinate until the end of August. Light rains in October and approximately 3.5 in. in November resulted in the production of surprisingly good yields from cereal experiments. The summer season of 1954 was more favourable, for although crops sown in early December received little rain in December and January, the registration of 7 in. in February enabled fair crop development. The current winter programme commenced with light rains in early June which permitted planting of some cereal and other winter crops on long fallowed land where adequate stored moisture was available to ensure crop establishment. More rain is necessary, however, to complete the sowing of all experiments and areas for the multiplication of special seed lots, the latter work being an important function of this Station.

Crops.

Wheat.—A trial of slow-maturing varieties was sown in mid-May of 1953 and the remaining experiments were planted dry during late July and early August. After 1.20 in. of rain on August 29-30, the cereals germinated in early September; fortunately, the temperatures remained low enough on the flats to prevent a heavy germination of summer weeds and grasses. The month continued dry, but a light fall of approximately 1 in. in mid-October was most helpful and a further fall of 1.43 in. coincided with the critical heading stage and contributed to the reasonably good yields obtained. Plantings in lighter soils on the higher country were more affected by weeds, the environment being warmer than the flats, and as the crops matured more quickly the November rains were not very helpful in increasing yields, as the plants were past the head formative stage of development. The incidence of rust was slight and harvesting of the main trials was conducted in ideal weather in December. The May-sown

wheat which was harvested in November included a seed production area of Lawrence sown on well fallowed ground which yielded approximately 36 bus. per acre.

The standard wheat varietal trial, although commenced late in the season, illustrated the relative merits of varieties classified as quick- and slow-maturing wheats. The order of superiority in the quick-maturing varieties was Fedweb 5 (45.2), Gabo (44.5), Spica (43.8), Seafoam (40.7) and Puora (39.8 bus. per acre), while the slower maturing varieties produced as follows:—Celebration (43.4), Charter (39.2), Festival (39.2), Puseas (38.7) and Lawrence (37.2 bus. per acre). A rate of planting trial was conducted with both Gabo and Seafoam sown at 50, 66 and 83 lb. per acre. No significant differences in yield in relation to amount of seed sown were obtained, but Gabo out-yielded Seafoam in all rates, the mean yields being respectively 39.1 and 34.8 bus. per acre. There was slightly less tillering from wheat sown at the heaviest rate and the yields did not support the principle of heavy seeding rates for late sowings.

In the fifth year of a study of the effect of nitrogenous and phosphatic fertilizers in comparison with bare fallow and the incorporation of a green manure crop on subsequent wheat yields, it was again shown that under dry conditions, sulphate of ammonia gives no economic advantages. Although superphosphate stimulated more vegetative growth and earlier maturity, only slight gains in yields of grain were obtained. Cowpeas were used as a green manure crop, but the resultant moisture stress experienced by the wheat once more indicated that the use of green manure crops between annual wheat plantings is not beneficial except perhaps in very wet seasons.

Oats.—Yields of Klein, Vicland, Garry, Bovah and Orient varied from 26 to 24 bus. per acre and pure seed supplies were increased for further trials. Vicland and Klein have given excellent results at Hermitage for some years, and Bovah, a variety developed at Hermitage, appears to have good prospects as a grazing oat for the wetter districts.

Grain Sorghum.—Plantings were made in late November following 2 in. of rain, half of which was recorded in a heavy storm lasting 20 minutes and accompanied by much runoff. As only light rains were received in December and January, the high rainfall in February gave more benefit to mid- and long-season varieties which were not as advanced as the quick-maturing types.

Alpha, Caprock and Wheatland were the three best varieties in the varietal trial, with respective yields of 50, 39 and 35 bus. per acre. Kalo and Early Kalo were depressed to 32.3 and 21.1 bus. per acre, however, owing to the late arrival of the February rains. A pure seed propagation area of Kalo on long fallowed land where moisture stress was not obvious produced 45 bus. per acre. In a trial of Alpha and two as yet unnamed hybrids, Alpha yielded 73.8 bus. compared with 43.4 bus. by the better hybrid. Alpha has been outstanding for Hermitage conditions over a range of seasons.

Sunflowers.—A varietal trial conducted to compare the four most likely varieties for the eastern Darling Downs environment yielded (in lb. per acre) as follows:—Jupiter 617, Giant Russian 576, Polestar 468 and Sunrise 307. Jupiter was more uniform in growth and matured more evenly than Giant Russian; the latter ripened rather unevenly, and in addition also its late maturity could be a disadvantage in the comparatively short growing seasons experienced on the Downs.

Other Crops.—A maize trial conducted in conjunction with Gatton College to test 22 hybrids and an open-pollinated variety has not yet been harvested but promises fair yields from the best producers.

Pastures.

Excellent establishment of grazing pastures of Rhodes grass and lucerne with small quantities of Wimmera rye and phalaris was obtained on the northern hillside portion of the Station in a sowing on February 8. However, older established pasture mixtures which contained lucerne have not been outstanding during the relatively dry year, as the lucerne utilized most of the available moisture, with a consequent domination of the associated grasses.

Nursery.—The observations on plant response to rainfall and temperatures have been continued in a wide range of winter and summer growing grasses and legumes. The most promising winter grasses include *Phalaris tuberosa*, *Bromus catharticus*, *Bromus inermis* and *Lolium rigidum*, and although some winter legumes—Louisiana white clover, Tallarook late sub-clover and *Vicia dasycarpa*—show promise, the native burr medic is still regarded as a most valuable component of any winter pasture. Among the 26 summer grasses under observation, the various strains of Rhodes grass and green panic are still outstanding. Promising results have been obtained with the summer legume *Phaseolus lathyroides*, but Hunter River lucerne still surpasses all legumes in yield, persistence and palatability.

BILOELA.

The winter of 1953 was dry, planting rains for autumn and winter growing crops not occurring until an exceptional fall of 2.73 in. was experienced at the end of August. The spring and summer were favourable for crops and pastures but were marked by several torrential thunderstorms and a severe hailstorm on December 26. The wet season finished abruptly at mid-March, with no rain of any consequence from then until early June, when a very timely fall of .83 in. was just sufficient to link up with the subsoil moisture in well-prepared fallows and to allow planting of cereal crops.

Crops.

Oats.—The late planting of the Vicland and Fultex varieties in early September for seed increase was ruined by a very severe attack of Victoria blight, the first occasion on which this disease had been recorded at the Station.

Wheat.—Although the planting rains at the end of August were very late for wheat in the Callide Valley, a standard varietal trial was sown on September 2. No further rains occurred until the short-season varieties were in head. These rains were of little value and under difficult seasonal conditions the satisfactory yields presented in Table 2 were obtained.

TABLE 2.
WHEAT YIELDS IN VARIETAL TRIAL.

Variety.	Yield. (bus. per acre).	Variety.	Yield. (bus. per acre).
KGPF 4521 ..	24.5	K.P. 4620 ..	22.1
Charter ..	24.4	Saga ..	22.0
Puno ..	24.3	Lawrence ..	19.0
Gabo ..	23.1	Pusa 4 ..	18.8
Spica ..	22.6	Puora ..	16.6
Festival ..	22.1	Seafoam ..	16.8

A late-season experiment was conducted with Three Seas wheat wherein five planting rates ranging from 50 lb. to 90 lb. per acre resulted respectively in yields from 21 bus. to 18 bus. per acre. A slight gain was obtained with the lighter seeding rates, as the degree of stooling and size of heads more than compensated for the lesser plant populations.

Cotton.—Good October rains permitted the planting of all trials at the end of that month and satisfactory growth was made throughout the season in most areas. Heliothis damage in the early part of the season and heavy rains in February reduced first pick yields, but the rains also induced good upper growth of plants and heavy boll setting for an above-average second pick. It is anticipated that the rain-grown cotton will average approximately 1,100 lb. and the irrigated cotton around 1,300 lb. seed cotton per acre. An irrigated versus dry farmed trial embracing three varieties yielded a gain of 192 lb. seed cotton per acre in favour of the irrigated cotton. In a similar trial last season under very wet conditions the dry farmed cotton led by 176 lb. per acre.

In the irrigated varietal trials, which have not been completely harvested, Empire continues to give promising results and Miller 41-S has as usual produced well. In the dry farmed varietal trial, Empire and Miller strains have shown good drought resistance and yielding ability. In the mechanical harvesting trials, first-pick yields have been in the vicinity of 500 lb. per acre with a harvesting efficiency around 70%.

Extensive experiments with chemical defoliation of cotton prior to machine harvesting have given encouraging results. Special attention is being given to formulations readily available in Australia, and the economics of spraying and the effect on cotton quality are being investigated.

Grain Sorghum.—The standard varietal trial was planted on December 7 on soil wet to an average depth of 19 in., and there was some evidence of lack of moisture in January. Earliness of maturity governed the position of the varieties with regard to yield, owing to the fact that midge damage to primary heads increased according to the lateness of maturity and no worthwhile quantities of grain were obtained from secondary heads. Early Kalo, which was last in the trial of last year, was first this year, mainly on account of earliness. Results of the row spacing trial, using 14, 28, and 42 in. row spacing, followed the pattern of last year, the respective yields being 12, 14.1, and 14.1 bus. per acre.

Lucerne.—The stand of sward and row irrigated and dry farmed lucerne planted in 1950 was disced in January, 1954, and oversown in separate areas of Rhodes grass, green panic and buffel grass, in an experiment planned to obtain information on growth of these grasses in combination with lucerne. The alternate green panic and lucerne rows planted in 1950, which suffered invasion of the lucerne rows by green panic seedlings in 1952, showed a stand this season of approximately 50% of each species, with green panic yielding approximately 75% of the total production obtained. In the lucerne versus annual crops grazing trial, which now has completed its second year, lucerne has again produced double the combined yield of the annual crops, viz., oats in the winter and cowpeas in the summer.

Cowpeas.—Black cowpeas grown for seed increase yielded at the satisfactory rate of 15 bus. per acre. Unfortunately, the stem rot fungus, phytophthora, attacks this variety, and this may limit its usefulness to the drier districts. Seed production from the Cristaudo variety was improved by later planting than in previous trials. Mung bean (*Phaseolus mungo* L.) showed satisfactory promise in the first year of trial at Biloela.

Potatoes.—Certified seed of three varieties—Sequoia, Factor, and Manhattan—was used for a spring planting. Sequoia led in yield and produced the best quality tubers. The Manhattans were more heavily infected with scab and Factors produced a large proportion of small tubers.

Tobacco.—The usual seed increase plot grown for the Agriculture Branch suffered from adverse weather. Primary heads have yielded 20 lb. of seed, but a further 30 lb. is expected from secondary heads.

Sunflowers.—A trial of the four main varieties available yielded per acre as follows:—Giant Russian 676 lb., Sunrise 492 lb., Jupiter 431 lb. and Polestar 380 lb.

The special strain of Giant Russian used was shorter in height and produced smaller heads than usually found in this variety but had an extended flowering period and a late-maturing habit.

Linseed.—A rain-grown varietal trial which was planted with the assistance of supplementary irrigation to enable the trial to be started in early July suffered from lack of moisture during the main flowering period of early October and yields were not good. Uruguay, a slow maturer, benefited by late rains and yielded highest. Of the early varieties, Morocco and Newland were best, followed by Walsh.

Soybeans.—In a varietal trial the following yields per acre were obtained:—Nanda 442 lb., Clemson 358 lb. and Tokyo 283 lb. Nanda also yielded best last year and in other plantings this year produced up to 900 lb. per acre under better soil moisture conditions, whilst Clemson yielded 690 lb. per acre in a seed increase plot. Clemson showed the best resistance to bacterial leaf spot. Nanda proved the most suitable for mechanical harvesting. In the row spacing trial using 42, 34, and 27 in. spacing, no significant differences were obtained, but in the plant spacing trial using 4, 8, and 12 in. plant spacings in 42 in. rows, the 4 in. spacing was significantly better than the others. Nanda produced a yield of 900 lb. per acre following giant setaria, compared with 800 lb. per acre following cotton in an adjacent area.

Pastures.

The usual observations and additional trial plantings were made in the nursery plots throughout the year and further seed increase plantings were established under irrigation. The logical continuation of this work was extended to include field grazing trials of the most promising species. Two strains of Rhodes grass, three strains of buffel and two of green panic were tested in single plots under normal grazing conditions for palatability, bulk (both green and dry) and recuperation after grazing. The type "D" buffel grass and Q2966 green panic were the outstanding strains, whilst the CG.48 Rhodes grass was preferred by cattle during the autumn. No palatability differences were noticed between strains of the same species. An experiment on depth of planting green panic resulted in fair germination by surface broadcasting, good results at $\frac{1}{2}$ in. and 1 in. depths and nil germination when seed was sown 3 in. deep. Grass seed harvesting work has been continued, further information being obtained on methods and time of harvesting, effect of heating and moisture content in relation to viability and storage of seed.

Brief comments follow on a few introduced species which have been under special study for several seasons:—

Urochloa mosambicensis, a prolific seeder and therefore a potential pest in cultivations. However, ploughing at the end of the wet season killed all plants and seedlings were successfully controlled in the following 12 months.

Panicum makarikariensis is palatable to stock and makes good autumn growth. It has a spreading habit and roots at the nodes but produces very little viable seed. Testing of strains with better seeding habits is contemplated.

Buffel grass type "D".—Such heavy demands for seed supplies have been experienced that it will be necessary to increase seed production. Public interest in this species is exceptional.

Pigeon pea.—The seed increase plot was again frosted in June but some seed may be recoverable. It is quite evident that the season is too short in this district for seed production. However, the species shows promise as a drought resistant shade and fodder plant.

HCN Investigations.

African Star Grass.—Analyses have been made on 27 different occasions throughout the year in conjunction with cattle grazing tests with this species. Despite a high HCN level (63 mg./100 grams green material) in the spring growth, previously starved animals grazed the area with no ill-effects. Lower HCN levels were found during the wet season early in 1954, when growing conditions were uniformly good, but it was also found that the addition of sulphate of ammonia increased the HCN content, especially in the autumn.

Sorghum alnum.—A HCN reading of 68 mg./100 grams green material was obtained in November, but again with no harmful effects on cattle grazed. The HCN readings decreased as the season advanced. The rhizomatous habit of this species and its prolific production of seed indistinguishable from Sudan and Johnson grass, along with its vigorous growth and quick seeding habits, form sufficient evidence to recommend the exclusion of this plant from agricultural districts.

AYR.

The weather experienced over the 12 months was irregular and often unfavourable for agricultural crops. Below-normal rainfall and sustained high temperatures during the first half of the season created heavy demands for irrigation. With the onset of the wet season above-normal rainfall until the end of April severely retarded all cultural operations and delayed by at least a month the planting of the programme of experiments grown during the autumn, winter and spring. Crop yields during the first half were lower than in the previous season and the lateness of the autumn plantings may also reduce yields of some crops; pasture growth, on the other hand, was stimulated by the prolonged wet season.

Crops.

Cotton.—The results of trials of 7 varieties planted in early March, mid-April and early August indicated once more that planting as soon as possible after the wet season increases the chances of obtaining high yields, the March planting yielding up to 1,689 lb. seed cotton per acre whereas the August planting had to be abandoned at the onset of the next wet season. A trial embracing a range of defoliants and various concentrations thereof yielded indecisive results, although sufficient defoliation was obtained to allow of fairly successful mechanical harvesting.

Maize.—In a trial of long season Queensland hybrids planted at mid-March, Q431 and Q692 led with yields of approximately 99 bus. per acre harvested early in September. In an August planting of a combined fertilizer and short-season hybrid experiment, Q724 led with 82 bus. per acre when given a side dressing of 2 cwt. of sulphate of ammonia, compared with only 64 bus. without the fertilizer. Further information on the value of fertilizing maize crops was obtained in a trial on soil of only moderate fertility. A basal dressing of complete fertilizer followed by two side dressings of sulphate of ammonia resulted in an average net return of £18 per acre more than from the unfertilized plots. The fertilized fields yielded an average of 87 bus. per acre.

Grain Sorghum.—Kalo outyielded four other varieties of grain sorghum with a production of 62 bus. per acre. The yields were severely affected by parrots.

Sunflowers.—A row and plant spacing trial with the Jupiter variety showed that plants spaced 12 in. apart in 18 in. rows gave the highest yield (1,630 lb. of seed per acre) and these plants proved to be most suitable for machine harvesting.

Wheat.—The average yield of 41.5 bus. per acre from the 10 varieties included in the test was reduced because of the inclusion of one very late strain. The earlier maturing varieties again demonstrated their value for this district and Pusa 4 and K₂P₄ 4620 each yielded over 50 bus. per acre.

Oats.—In an observational trial of 20 varieties the earlier-maturing types tended to produce greater yields, with Vicland leading. A bulk area of this variety produced 21.9 bus. of seed per acre, and samples cut at hay stage indicated that 2.75 tons of dry hay could have been obtained.

Barley.—In view of the low nitrogen status of the soils on the Station, two varieties of barley were grown to test the effect of this environment on malting quality. Yields of up to 27.2 bus. per acre were obtained, but the quality of the grain was not quite up to the required malting standards.

Linseed.—An increase plot of Golden Viking linseed yielded at the rate of 567 lb. per acre.

Rice.—Several varieties of rice of the "swamp" and "upland" types were sown during January, the two "swamp" varieties being placed in an improvised pond into which irrigation water was pumped daily to keep the ground covered to the required height. The plants

in the pond were 54 in. high, but the "upland" types were much smaller despite a rather prolonged wet season. Harvesting of the crops had not been completed at the end of June.

Legumes.—Several cowpea varieties were grown for observational purposes, while other legumes such as pigeon pea and phasey bean were planted for seed production.

Grasses.—Seed of guinea grass was gathered satisfactorily by the stripper, but in the case of roadside harvestings it has proved very difficult to eliminate the seed of various wild sorghum species from the sample. Seed of para grass was also harvested with the stripper and it is hoped that the caryopses in the sample are viable, as this species generally fails to set seed under Ayr conditions.

Soybeans and Safflower.—Several varieties of both soybeans and safflower have been planted this autumn to test their respective merits in this environment.

Pineapples.—Yields demonstrated the necessity for maintenance of clean cultivation by mechanical or chemical methods. Growth of inter-bed crops seriously decreased pineapple yields because of competition. The use of MCPA for fruit induction increases fruit size significantly and has no harmful effect upon sucker growth. Carbide shows a tendency to produce "drumstick" fruit and lacks the ability to force fruit production on the more vigorously growing plants. Yields from new plantings have indicated the advantage of vigour in the planting material.

Bananas.—The plantation suffered severely during the cyclone experienced at mid-season, the Gros Michel variety having to be replanted.

Pastures and Stock.

It was possible to depasture 46 head of 2-year-old Shorthorn steers on the 25 acres of irrigated pasture now under test at the Station. During the warmer and wetter parts of the season the leading pastures—para grass + centro, guinea grass + centro, and guinea grass + stylo—carried 2 and at times more beasts to the acre. Rhodes grass + stylo, however, again produced the highest quality winter forage. Average weight gains of the order of 1.04 lb. per day per beast have been made over a 238-day period, with gains of 2 lb. per day and over being recorded from the leading mixtures during the most favourable period. The legume components showed a decline following the wet season and the onset of the cooler weather, but otherwise a satisfactory balance of grass to legume was obtained.

KAIRI.

After an excessively wet mid-season in 1953, extremely poor conditions prevailed from March and the winter and spring of 1953 was a dry period accompanied by more severe frosts than normally experienced. Adequate planting rains did not occur until late December—early January, when the bulk of the summer crops was sown. From then on favourable climatic conditions for plant growth were experienced until June, which was somewhat dry for autumn-sown crops.

Crops.

Maize.—1952-53 Crop.—As forecast in the last Annual Report the yield of maize from all experiments was very low. Following an excessively wet growing season which did not permit of adequate cultivation to control weed growth, and which was also conducive to the development of virus disease and cob rots, the 1952-53 crop yielded poorly. Yields ranged from 18.34 cwt. per acre from early-planted areas to almost complete failure from late January plantings. Mean yield from all sowings was 9.625 cwt. per acre. The combination of late plantings and rainfall totalling 30 in. in the January-February period was not satisfactory for experimental work. However, the experiments with pre- and post-emergence weedicides provided valuable information of the efficiency of various forms of 2,4-D in controlling weed growth. Contact spraying was effective in controlling 45-69% of weeds, but it was shown that pre-emergence sprays had no advantage over the normal early cultivation practices.

1953-54 Crop.—Prospects for the crop of the current season are much brighter. Yields are expected to reach well over a ton per acre and indicative results are confidently anticipated from most experiments. A feature

of the operations has been the marked improvement in weed control in maize areas following hormone weedicide spraying at the rate of 1 lb. acid equivalent of 2,4-D (sodium salt) per acre. However, it is becoming evident that hormone weedicides are not a complete solution to the problem of preventing tall-growing weeds such as wild hop (*Nicandra physaloides*) from interfering with mechanical harvesting. This weed can germinate late in the season when the drying mature maize allows entrance of light, and the resultant weed growth may develop to several feet high before the grain is dry and thus seriously reduce the efficiency of the harvesting machines.

Experiments to investigate maize culture include:—(1) Rotation of lucerne + Rhodes grass pasture and maize; (2) combined plant spacing and sulphate of ammonia side-dressings trials; (3) hormone weed control trials (three experiments); (4) maize varietal trial; (5) hybrid maize observation trial; (6) stubble-mulch versus standard practices trial; and (7) land usage (rotation) trial.

Oats.—Trials were extended in 1953 to include new rust-resistant strains. Though none produced quite as well as the popular variety Vicland, which yielded 3 tons hay per acre, all showed good drought resistance. A pleasing feature was the good performance of Bovah, which has been bred by the Department as a grazing oat with resistance to crown rust and Victoria blight. Weed problems are so severe in this area that hormone spraying of oats has been investigated. Application of $\frac{1}{2}$ lb. acid equivalent 2,4-D per acre one month after planting and again a month before harvesting was necessary to obtain hay of good quality. The potential value of March planting of oats for grazing is shown by the results obtained in a field of Vicland planted on March 31, 1954, which by June 2 produced at the rate of 2 tons of green feed per acre, of which 1.8 tons per acre were eaten by the dairy herd with only 5.10% of the plants being pulled out during the grazing. Good regrowth had occurred by the end of that month.

Wheat.—The dual-purpose rust-resistant variety Lawrence was again sown in 1953 and made satisfactory growth. The crop was grazed by the dairy herd but proved less palatable than did oats. During the current season, work with this variety has been extended to include a time-of-planting trial embracing sowings in March, April and May. A heavy germination of summer weeds occurring after the March, 1954 sowing was controlled by spraying at the rate of 1 lb. acid equivalent of 2,4-D per acre.

Cowpeas.—The Cristaudo variety was again sown for green manuring purposes. Root examinations revealed that nodulation was excellent whether the seed had been inoculated or not.

Fodder Crops.—The testing of sugar-cane seedling material selected at Meringa Sugar Experiment Station as potential fodder canes has been continued. Green yields of up to 88.5 tons per acre were recorded from first-year plants. Increase areas of the most promising varieties that have been released from quarantine have been planted to provide planting material for district trials.

Arrowroot promises to make an excellent crop this season. Planted on the first summer storms (November), it has done much better than in later plantings in previous seasons.

Miscellaneous Crops.—Land and facilities were again made available to the Horticulture Branch for trial plot of coffee, and to the Agriculture Branch for investigations in tea growing and soil conservation practices.

Silage.—One hundred tons of maize were ensiled from maize grown for silage in the rotation series. Methods were investigated for conserving wet-season lucerne, lucerne and grass pasture and weedy summer lucerne in stack silos of the wedge and bun types. This silage will be fed in spring.

Pastures.

Legumes.—*Glycine javanica* suffered more severely from frosts than in past seasons but again made good recovery during the summer months.

Lucerne.—The main area of lucerne grown for hay at the end of its seventh year of establishment showed evidence of deterioration, the decline in stand being

accompanied by invasion by weeds and grasses. Lucerne grown in rows 28 in. apart showed good drought resistance during the dry winter months, but presents something of a problem when cultivation cannot be carried out to control weed and grass growth during the wet season.

Lucerne-Grass Mixtures.—Difficulty has again been experienced in establishing Rhodes grass over weedy lucerne in the rotation series, and experiments have been initiated to discover suitable techniques. The sparsest and most weedy portion of the seventh year stand of lucerne reserved for hay production was ploughed at the beginning of the wet season and a seedbed was hurriedly prepared and oversown to green panic grass. A good regeneration of a large percentage of the old lucerne crowns was obtained; this, coupled with a good strike of the grass, has resulted in the production of an excellent high-protein pasture.

Grasses.—In the grass single species trials, kikuyu and paspalum produced the best year-round green growth, but it is doubted whether their total yields equalled that of the taller growing tropical species, green panic and common guinea grass. Though green panic was browned off by each frost during last winter it was quick to shoot again with the onset of warmer

conditions, but guinea grass was much slower. Other grasses used in grazing studies included para, molasses, scrobie and Rhodes. The last, though widely used on the Station, is inferior to green panic and guinea grass during the wet season, but if mown at the end of the wet season will supply valuable grazing during the winter because of the deep root system and a degree of frost tolerance. Observations of elephant grass strains used for grazing have been continued, and the introduced strain CPI. 7831 appears most promising. A superior standard of grazing was obtained with the dairy herd in a mixed lucerne-Rhodes grass pasture that was strip grazed on the basis of 33 cows per $\frac{1}{2}$ acre during the day and a fresh $\frac{1}{2}$ acre for the night, with repetitions until the 12-acre paddock was grazed off. This method, using portable electric fences, appears to offer a solution of the problem of obtaining economical rotational grazing and pasture control.

Animal Investigations.

Facilities were again provided for investigations related to poultry, pigs and the dairy herd that are conducted by the Division of Animal Industry. Details of the results obtained are included in the reports of the appropriate Branches.

HORTICULTURE BRANCH.

Dr. S. A. Trout, Director of Horticulture.



Dr. S. A. Trout.

Weather conditions in coastal areas of southern and central Queensland were reasonably satisfactory during 1953-54, with well distributed rains and a general absence of extreme temperatures. The winter was relatively mild and little frost damage was recorded in pineapples and bananas, though cool temperatures in spring and early summer delayed the onset of the new season's growth. Drought conditions occurred in the Granite Belt for part of the year and adversely affected deciduous fruits, and also in North Queensland, where the summer crop of pineapples was below expectations. Cyclonic storms in February caused considerable damage to banana, apple, and vegetable crops.

Price levels for horticultural produce became more competitive during the year. Established growers are reasonably well equipped to handle the associated problems, but the position is less satisfactory in the case of new growers with limited capital and experience at their disposal. Many of these men have settled on land which can only be made productive by considerable capital expenditure on drainage and other cultural measures necessary to improve both the structure and the fertility of the soil.

PINEAPPLES.

The pineapple is the most important fruit crop in the State and expansion continues steadily in all areas, though perhaps more so in Central Queensland than elsewhere. The current acreage under crop is 11,000, of which about 2,000 acres were established in 1953. A record summer crop of 1,409,000 cases was harvested in 1954, of which 1,165,472 cases were processed. The quality of the fruit has been generally good, but considerable difficulty has been experienced in getting the requisite amount of colour in the canned pack, and colour standards for factory fruit have had to be raised.

Cultural.

Current fertilizer recommendations formulated some 25 years ago have, on the whole, served the industry well. The area of pineapples established on replant land has increased, and declining yields are not uncommon even when orthodox cultural practices are adopted. Continuous cropping causes a progressive drop in the pH, and the soils may become too acidic even for pineapples. Agricultural lime or dolomite is therefore needed in some areas in order to restore productivity. Departmental experience indicates that it can best be applied to the inter-cycle green manure crop. On some soil types such as the light sandy loams of the Glasshouse district, the standard fertilizer programme may not supply enough potash to meet the requirements of the crop, for in trials on these soils, additional potash has produced both larger crops and better fruit quality. Urea, a foliage spray with a high nitrogen content, is now under investigation and may prove of value in southern Queensland where conditions in winter are seldom favourable for the rapid uptake of nitrogen from the soil by the pineapple plant.

Alpha-naphthalene-acetic acid (ANA) has been used extensively to induce flowering in the pineapple crop, particularly in plantations which are established for the production of a summer plant crop. The use of this substance for increasing fruit weight has been under investigation for several seasons, and interesting results have been obtained. During the current year, yields in the plant crop were increased by more than 20% at concentrations of 100-150 ppm to the developing fruit eight weeks before the anticipated time of harvesting. The treatment had no adverse effect on the ratoon crop.

Cannery deliveries in North Queensland may have to be spread in order to overcome some of the difficulties encountered in the processing of the summer crop. This should not be difficult, for at Ayr Regional Experiment Station it has been shown that crops established in autumn bear a plant crop within 12 months and sucker

freely for ratoon crops which mature in spring and early summer. At Rockhampton, valuable information has also been obtained regarding times of planting and the type of planting material suitable for the district.

Loss of the soil organic matter under continuous cropping is evident in some districts. Turning in the old pineapple crop residues at the end of the cycle is apparently not sufficient. At Maroochy Experiment Station green manure crops grown in quick succession during an inter-cycle period of about 18 months increased yields in the following pineapple crop by about 25%. Poota pea in summer and New Zealand blue lupin in winter have been used for this purpose, but it is probable that a rust-resistant oat variety may be a better winter crop than New Zealand blue lupin, which seldom does well in coastal areas.

Frost Prevention.

Frost damage to pineapple plantations occurs periodically and may reduce production output by approximately 25%. Methods of minimising these losses have been investigated in a series of co-operative experiments in which Departmental officers have played an active part.

Orchard heaters and a wind machine were tested during the 1953 winter. The rise in temperature produced by either method was related to the inversion—i.e., the difference in temperature between air at 2 ft. 6 in. and that at 40 ft. Average inversion during the five nights when screen temperatures fell below 34° F. was 6.2° F., compared with 5.9° F. for the whole winter period. Under these conditions, nearly 200 heaters per acre, each burning $\frac{1}{4}$ gallon of diesel oil per hour, were required to produce a rise in temperature sufficiently high to prevent severe frosts. The wind machine increased ground temperatures in an area of an acre around the machine by 2° F., and in an acre surrounding this area by 1° F. In a comparative experiment under similar conditions, 135 heaters produced the same result. When the wind machine was used in conjunction with the heaters the effect was equal to the sum of the effects produced by each method separately. By concentrating the heaters in the direction of the prevailing westerly wind drift, which averaged 3 m.p.h. for the whole season, a much greater area was warmed. The wind machine used in these experiments is not as effective in pineapple plantations as in citrus orchards because some of the warm air circulated by the machine is lifted above the level of the plants.

Other approaches to the problem of frost prevention are now being investigated in greater detail, particularly the study of soil temperatures in relation to air temperatures. Temperatures taken at a depth of eight inches in the dry sandy soil of the experimental area were at least 20° F. higher than those at the surface. During the night, heat is radiated from the ground, and soil type and the condition of the soil therefore have a very great influence on temperatures near the ground. Keeping the soil moist and very compact assists heat conduction from the upper layers of the soil to the surface and can therefore reduce the risk of frost injury to plants by keeping the soil around the plants much warmer.

Black Heart.

Internal discoloration known as black heart affects the winter crop, thus depressing fresh fruit prices and restricting interstate and overseas outlets. An appreciable reduction in black heart was obtained in 1952 by placing protective covers over the fruit about six weeks prior to harvesting, but similar results were not obtained in the 1953 trials. Further work is in progress, together with tests on spraying the fruit with para-chlorophenoxy-acetic acid (PCPA), which has reduced internal breakdown in Florida pineapples, and has delayed maturity in the summer crop at Ayr Regional Experiment Station.

Chemical Work.

The chemical composition of pineapples grown on different soil types in Southern Queensland under various fertilizer treatments has been determined. Excess nitrogen reduced both the sugar and acid content

of the juice. Phosphoric acid increased juice acidity, while potash increased both sugar and acid, thereby improving palatability.

These results may be relevant to fertilizer practices in the Wet Tropics where pineapples are rather low in acidity and tend to lack character. The potash requirement of the plant is therefore being investigated at Kamerunga.

BANANAS.

Conditions during 1949-52 were far from satisfactory for planting and the acreage of bananas established was appreciably below normal. During the last 12 months the acreage has increased from 12,729 to 14,130, which is slightly less than in 1948. Current production in 1954 will be reduced by the widespread damage to plantations from the February cyclone.

The disease position shows an improvement and the few recorded outbreaks of bunchy top had little effect on overall production. The Banana Industry Protection Board has exercised close supervision over the industry in regard to planting policy and disease control. The size of suckers and bits used for planting has been increased by Regulation in order to bring them into line with current advisory recommendations.

There is growing interest in the use of irrigation for bananas, and irrigated areas are under observation in the Rosedale and Redland Bay districts. Irrigation reduces the drought hazard, which has always been a problem in non-irrigated plantations, and permits the grower to market most of his fruit during the winter and spring months, when prices are relatively good.

Arsenicals are widely used for weed control purposes in banana plantations. Though cheap and reasonably efficient, they are objectionable to handle, and frequent applications are necessary during the wet season, particularly on old replant land. Under such conditions, PCP used as a pre-germination spray has proved more efficient in trials at Currumbin. The treatment schedule is the same as that already practised in the pineapple industry, viz., 10-20 lb. PCP per acre applied in solution to weed-free ground.

Views on the life of a banana plantation have changed considerably since fertilizer treatment became standard practice and growers have adopted the one-follower system devised by the Department and since demonstrated on a plantation scale. It is now clear that there is still scope for improvement in production on these lines, for at the Maroochy Experiment Station, on land which is far from ideal for the crop, 4th ratoon bunches are at least equal to those of earlier crops and plant vigour shows no signs of diminishing. This result is further justification for plantation management based on good planting material, clean cultivation, adequate fertilizer and controlled cropping.

Waxing.

Following successful experimental work, waxing of bananas has now become an established commercial practice. By dipping banana bunches in a water-base emulsion containing micro-crystalline and paraffin wax, weight losses during ripening have been reduced by 50%, skin blemishes largely controlled and the life after ripening extended by several days. This treatment should enable bananas to be carried to country towns in a more attractive and firmer condition; it may also be a means of holding fruit during periodic gluts. Some minor improvements in the type of wax and the emulsifying agent may be necessary to improve the appearance of the coating.

CITRUS.

The 1953 citrus crop was 430,000 cases, compared with 470,000 for the previous year. An average crop with better yields in inland districts is expected for 1954. Queensland's advantage of earliness has become less important, as southern States can market their oranges and grapefruit much later and the quality is generally superior to our early consignments, which lack both colour and flavour. This does not apply to mandarins, which are grown almost exclusively in Queensland and are allowed to remain on the tree until fully mature. Interest is therefore centred in the stock-scion trials with mandarins now under observation.

Under the citrus budwood and seed distribution scheme, 200 lb. of seed and 122,500 buds were distributed during 1953. A large proportion of the budwood supplied to nurserymen goes into the production of trees

sold to householders. It is therefore proposed to reserve the best budwood for the requirements of commercial citrus growers. Details of this scheme are under consideration by the Queensland Nurserymen's Association.

During the past three years, several new varieties of citrus and a number of promising strains of existing varieties have been introduced to Queensland and propagated on suitable stocks established in pilot plots throughout the major citrus districts.

Of particular interest is the behaviour of commercial varieties on trifoliata stock, which may prove useful in areas where tree failure from brown rot gummosis is a commercial hazard. This stock has already found a place in the citrus industry further south. It is, however, deciduous in habit, and conditions in subtropical regions of Queensland may be less favourable for it. So far, tree performance has been highly variable from district to district but some time must necessarily elapse before a final appraisal is possible.

Wastage.

The control of mould wastage and weight losses in oranges and mandarins has been further investigated. The colouring of fruit artificially can cause skin blemishes with resultant mould wastage if the method is incorrectly applied. A survey of growers' practices has shown a wide variation in the maturity of fruit being coloured and in the temperature, humidity, ventilation and concentration of acetylene in the ripening room.

Several methods of mould control in mature fruit have been tested, using wraps and cardboard cartons impregnated with diphenyl and also various fungicidal solutions. Impregnated cardboard cartons of the American type are not suitable for Queensland citrus, as the fruit is insufficiently ventilated. Diphenyl wraps were very effective in controlling wastage from green mould provided the amount of diphenyl in the wrapping paper was carefully controlled. High concentrations caused taint, while low concentrations were ineffective. Equally good results under comparable conditions were obtained with a soluble diphenyl compound (sodium ortho-phenyl phenate of 2% concentration) to which 1% hexamine was added to prevent skin injuries caused by phenolic compounds. A solution containing 4% borax and 2% boric acid gave good control of green mould and also of stem end rot.

Chemical Work.

Fruit quality in relation to rootstock has now been determined over a period of three years on fruit selected from the citrus budwood plot at the Maroochy Experiment Station. No definite conclusions can yet be drawn regarding the effect of lemon, orange, mandarin or trifoliata stock on the sugar and acid content of Washington Navel oranges. The palatability of fruit grown on lemon rootstock was, however, inferior to that of fruit grown on other rootstocks. In Joppa oranges and Glen Retreat mandarins, rootstocks had no effect on fruit quality. The trees are still young and the type of rootstock may affect fruit quality at a later date.

DECIDUOUS FRUITS.

Deciduous fruit growers have had an indifferent year. The fruit set was good and a record apple crop was expected. However, very dry conditions prevailed until February 1954 and as a result much of the stone fruit crop and early varieties of some fruits were undersized. Good rain fell in February, but it was accompanied by cyclonic winds which damaged trees and fruit. Although a very good crop of apples was harvested, most of the fruit was not of fancy grade. The grape crop also suffered from climatic conditions and the quantity of fruit harvested was 120,000 half-bushel cases, compared with 205,000 cases in 1953.

Though there has been a shortage of young trees during the past few years, the area under apples and plums is still increasing and many new orchards have been established in the Granite Belt. The acreages under crop in the Granite Belt in 1953 were:—apples 7,796, apricots 299, pears 341, plums 1,260, peaches 1,460, grapes 1,907. The estimated production for 1953-54 is as follows:—

					Bushel cases.
Apples	..	..	..	..	510,000
Pears	..	..	..	..	29,000
Plums	..	..	..	..	59,000
Peaches	..	..	..	..	62,000
Apricots	..	..	..	..	12,000

The soils of the Granite Belt are frequently too highly acid for normal growth, and trace element deficiencies require constant attention. Lack of magnesium in the soil has been particularly difficult to correct in Departmental trials, where both orchard trees and grape vines have responded very slowly to applications of magnesium sulphate both as sprays and as soil dressings. Regular checks on the base status of the soil will therefore be necessary so that this deficiency will not develop into an acute form which can be remedied only over a period of years.

Fertilizers are regularly used by most fruit growers, and foliage sprays containing urea have been tested on the more important fruit crops grown at Stanthorpe. Urea appears to be of value when the shortage of nitrogen is due primarily to a temporary failure of the root system, but it is very doubtful if urea will replace ammonium sulphate as a fertilizer.

Heavy thinning of plums by hand is usually necessary during the season to maintain fruit size. In field experimental work, dinitro-ortho-cresylate (Dinoc) has shown promise as a thinning agent when applied at the early petal fall period. The real problem is to avoid excessive thinning, particularly in a season when natural shedding is high. Dinitro-ortho-cyclohexylphenol, a somewhat similar substance which is being investigated, may also prove useful in some early varieties of peaches which shed their buds in early spring and fail to set a crop after a warm winter. The spray is applied before bud burst at concentrations of from 0.03% to 0.06%.

Cool Storage of Apples.

The major portion of the Granny Smith and Delicious crop, the two main varieties grown in Queensland, is cool stored. Further trials were conducted with the 1953 crop to determine the optimum stage of maturity for long storage, and methods for prolonging the cool storage life of Granny Smith apples.

Fruit from young trees was more susceptible to skin disorders than fruit from old trees. Wastage varied considerably from orchard to orchard and was related to the date of picking. Delicious apples picked at the end of February and Granny Smith apples picked in the first two weeks of April gave the most satisfactory storage results. The storage life of both these varieties was terminated in mid-October. No appreciable extension of storage life was obtained in comparable trials with Granny Smith apples stored in metal gastight cabinets containing a low concentration of oxygen with and without carbon dioxide. Excess carbon dioxide was removed by circulating the storage atmosphere through caustic soda, while apple odours were absorbed on activated charcoal.

Experiments over three seasons indicate that carbon dioxide concentration is the main factor in prolonging storage life, and low concentrations of oxygen alone are of little commercial benefit. A concentration of carbon dioxide as low as 2% can cause a serious skin blemish akin to superficial scald. Oiled wraps which control superficial scald in normal storage will not prevent its development in the presence of carbon dioxide. Further experiments using mixtures of carbon dioxide and ozone, which has controlled superficial scald, are now in progress.

Another method of prolonging storage life by dipping the apples prior to storage in wax or oil emulsions is being investigated. In previous trials, this method retarded the onset of storage disorders but the beneficial effects were largely nullified by skin injuries caused by the alkaline emulsion. A non-alkaline emulsion which has given good results with other fruits is being used in the present trials.

GRAPES.

The stock-scion trial in grapes continues to make good progress and the vines should soon be sufficiently advanced to enable the performance of Muscatel, Waltham Cross and Purple Cornichon grapes on phylloxera-resistant rootstocks to be assessed.

Fruit quality in relation to rootstocks was investigated with Muscat Hamburg, Waltham Cross and Purple Cornichon varieties from the experimental plot at Severnlea. Although the time of maturation and fruit quality were affected by rootstocks, the 1953 results differed in many respects from those obtained previously. Further experimental work will therefore be necessary before valid conclusions can be drawn.

PAPAWS.

Seasonal conditions have been favourable for the papaw crop and fruit quality has been generally better than in previous years. During the past 12 months the area under crop increased from 1,056 to 1,263 acres; the average annual production is about 250,000 cases.

The establishment of a factory at Koongal has stimulated the demand for canning fruit and has created new interest in bisexual types. One of these types, known as Guinea Gold, bears large fruit of good quality with a firm and highly coloured flesh. Bisexual papaws have not so far played an important part in the industry because in the subtropical areas where the bulk of the crop is grown their setting has been very erratic. Selected bisexual strains from Central Queensland are now being tested in the main papaw growing districts.

Varietal trials established in 1953 at the Redlands and Maroochy Experiment Stations are now bearing a plant crop. They include a number of local selections, Bettina, Bettina x Petersen hybrids and introductions from Hawaii and South America. The Bettina x Petersen hybrids withstand stress conditions much better than other strains of papaw and also bear more consistently.

Transplanting papaws in autumn frequently results in losses, particularly in subtropical areas. In recent plantings at the Redlands Experiment Station, seedlings beheaded in the nursery a week or two before transplanting rooted quickly when set out in the field.

Air Transport.

Papaws from Central Queensland districts consigned to interstate markets during the winter months frequently lack flavour because they have to be picked in a semi-ripe condition to withstand long rail transport. There is a keen demand for tree-ripened fruit, which must be handled with extreme care and transported by air. For this purpose, special 2-layered cardboard cartons, 11 lb. lighter than the tropical case, have been designed. Departmental officers supervised the handling and packing of two experimental lots forwarded from Rockhampton and Mackay to Sydney. The fruit arrived in very good condition and good returns were obtained. Future developments will depend on the availability of good fruit in close proximity to the airport and the premium the consumer is prepared to pay for better quality.

Papain.

Papain is present in the milky latex exuded from green papaws and is used in medicine and in industry. It has recently appeared on local markets as a meat tenderiser prepared from a product imported from Ceylon. Departmental officers have tested the tenderising qualities of the imported product and advised on the preparation of a stable tenderiser. Additional experiments have been conducted on the extraction of papain from the stem, leaves and fruit of Queensland papaws. Results have confirmed previous findings that recoverable quantities of papain are present only in the fruit, but the small yield makes its extraction uneconomic. Papain is present in quantity in a number of common weeds, shrubs and trees. The possibility of its extraction from these sources is under consideration.

STRAWBERRIES.

Although plantings in 1953 were only slightly less than in 1952, seasonal conditions considerably reduced production. Indifferent conditions made land preparation difficult for the 1954 crop and in consequence the plantings are on a much reduced scale. About two-thirds of the crop is supplied to factories for manufacture into jam and for canning. The factory intake in 1951, 1952 and 1953 was 447, 623 and 287 tons respectively. A premium of 5d. per lb. is paid for the better canning type, but difficulty is experienced in delivering berries in good condition to the factory. A survey of growers' harvesting and packing methods will therefore be made this season, while special factory containers have been designed in conjunction with the Committee of Direction of Fruit Marketing in order to minimise bruising during transit.

The Phenomenal continues to be the main variety, but some growers consider that it is now less productive than formerly. In field experiments clonal material selected from the variety has shown differences in yield, but it is doubtful if poor plant material is wholly responsible for the alleged poor performance of the variety in some years; faulty land preparation may be equally important.

Examination of quick frozen packs showed that firm ripe berries frozen in a cold sugar solution gave the best results. After three years' experiments, it can be concluded that no further improvement in the quality of frozen Phenomenal strawberries can be expected. This variety, though excellent for the fresh fruit market, is not entirely satisfactory for processing, and a firmer berry is required. Unfortunately, many of the firmer varieties grown in southern States have not performed satisfactorily in Queensland. Promising material may be forthcoming from varieties to be imported from warmer parts of the United States for trial under Queensland conditions.

The Approved Strawberry Runner Scheme again functioned during the year, and 13 areas were listed as sources of disease-free planting material, from which 317,000 runners were sold in 1954.

MISCELLANEOUS FRUITS.

Mangoes.

Mango growers had a reasonably good year; the crop cycle is back to normal and less off-season fruit was borne by the trees. Spring and early summer were relatively dry in the main producing districts and as a result the crop was rather late, but yields were above average and the quality of the fruit was generally good. The area under crop is 640 acres, and the production in 1953 was approximately 28,000 cases.

The industry has grown up as an adjunct to other crops, particularly in the Bowen district, and the trees seldom receive the cultivation, irrigation or fertilizer treatment they deserve. In addition, marketing methods are rather casual, with little grading of the fruit in the case and insufficient care in handling the fruit prior to packing. However, some of the larger growers now appreciate the possibilities of the fruit in southern States and standards of orchard management may be expected to improve.

Avocadoes.

Avocado growers had an indifferent year, for blossoming was erratic and the amount of windfall fruit during the wet season was excessive. However, the market demand for the fruit remains firm. The area under crop is 74 acres, and production in 1953 was 1,734 bushels.

Progress has been made in propagating the trees. Of the several methods used, the side tip graft has been thoroughly tested at the Redlands Experiment Station and some nurserymen have now adopted this method as standard. Suitable stock material is, however, scarce and far too many trees are propagated from seedling stocks other than Mexican, which is the only approved type. This difficulty is likely to persist until such time as new stock trees come into bearing and provide adequate amounts of seed for propagation. The death of single trees and groups of trees is still an important problem in established orchards. The trouble is usually associated with poor drainage, and great care is therefore necessary in selecting land for the avocado orchard.

A 2-acre orchard with several varieties of avocadoes has been established at the Redlands Experiment Station. This should provide fruit for the greater part of the year and prove a valuable source of budwood when the trees reach maturity. There is an urgent need to eliminate undesirable seedlings and to develop suitable types maturing between December and April, when the Fuerte and Nabal varieties are not available. With this object in view, an Avocado Advisory Committee of growers, agents and Departmental officers has been set up. As a first step, the Committee will evaluate the performance of any promising type on the basis of cropping habits, fruit quality and market acceptance.

Macadamia Nut.

Most of the Macadamia orchards in Queensland gave a variable performance during the year and confirmed the view that no worthwhile industry can be built up on seedling trees. Interest in the selection of superior trees for vegetative propagation is therefore on the increase. The problem is not so much the selection of suitable stock and scion material but grafting and transplanting methods. The percentage of successful grafts in the nursery is still far too low, but this may be remedied by speedier working and more efficient

after-care of the grafted trees. Transplanting losses, on the other hand, are apparently associated with the relatively poor root system of the young plant and in particular its lack of fibrous roots. It is therefore proposed to investigate the effect of root wrenching and kindred practices on the nursery tree as a possible solution of transplanting difficulties. An orchard of grafted trees has now been established at Maroochy Experiment Station and should provide useful material for various investigations.

The development of the industry also depends on outlets for the processed kernel. About 80 selections have therefore been made of rough and smooth-shelled types growing in the coastal areas between the Richmond Valley of New South Wales and Maryborough. The nuts are being dried and cracked, and the kernels cooked in oil and salted. The quality, based on colour and palatability, will be assessed initially after processing and again after several months' storage in vacuum. Observations so far indicate that nuts from existing seedlings vary so considerably in shell thickness and kernel quality that commercial processing of the present crop as a whole is a difficult problem.

Passion Fruit.

Some expansion in the passion fruit industry can be recorded, particularly in the Bundaberg area. The vines in this area have not yet been seriously troubled by the several diseases which make passion fruit growing so hazardous elsewhere, but yields have been very variable.

Fertilizer trials in this crop indicate that the vine has a high nitrogen requirement, at least in the red basaltic loams, and marked responses have followed supplementary applications of sulphate of ammonia during the growing period.

Propagation studies at the Redlands Experiment Station suggest that budding and grafting are relatively simple operations which may prove useful should stock types with resistance to *Fusarium* be isolated.

Figs.

The area under figs in 1953 was 40 acres, yielding approximately 6,000 bushels. A large proportion of the crop is manufactured into jam, for which there is a limited demand. The crystallizing of figs would provide an additional outlet for the surplus production; two methods of crystallizing figs have therefore been investigated. The more common method involves removing water from the fruit by dipping it frequently in a concentrated sugar solution; in the second method the fruit is dipped initially in sugar and then dehydrated. Both methods have given satisfactory results but require a small amount of preservative to prevent mould growth.

TOMATOES.

Tomatoes are an important vegetable crop in Queensland and from 5,833 acres in 1953 about 730,000 bushel cases were harvested. About one-third of this production is exported to southern States. The spring and early summer crops on the coast were reasonably good and the market was at times heavily over-supplied. However, at Stanthorpe, which supplies Queensland's requirements during the summer, drought conditions persisted until February and both early and mid-season plantings were failures. Even the late plantings were only partly successful, for cyclonic winds caused a great deal of damage in some areas. Crops planted on the coast in late summer and autumn of 1954 are generally in good order, though the fruit is being harvested later than usual owing to heavy seedbed losses following excessive rains in February.

Certified seed production at Stanthorpe was carried out under difficulties, and production for the year was as follows:—Q1—600 oz.; Q2—nil (carry-over stocks were sufficient for requirements); Q3—460 oz.; Q4—nil (carry-over stocks adequate); Q5—nil (crops sold on the more profitable fresh fruit market).

In coastal areas, earliness of maturity is an asset in the autumn crop, for fruit harvested in May invariably commands high prices. The effect of planting methods on crop behaviour has been investigated at the Redlands Experiment Station. The results show that in an irrigated crop sowing in the field results in an earlier harvest but a reduction in the number of fruits per plant as compared with plants established in the seedbed and transplanted when about 6 in. tall.

Varietal improvement continues to be a major project, and comparative trials carried out in all the more important tomato producing areas included certified Q strains, commercial varieties, introduced varieties and locally bred types with inherent resistance to nematodes and Fusarium and leaf spot infection. New types of particular interest are Strain 147, a nematode-resistant selection; Southland, an introduction from the United States with resistance to Fusarium; a C.S.I.R.O. selection from Valiant, the plant and fruit characteristics of which are particularly suited to the needs of Central Queensland; and some selections from Q3 x Bowen Globe cross which promise well in the Bowen district.

One striking development during the year has been the adoption of Q3 (now considered to be derived from Pearson) in the Bowen district for planting late in the season. The bush provides heavy shade for the fruit, which is an advantage in Bowen in September and October, when temperatures are generally too high for the local strains of Bowen Globe.

Three years ago, marked responses were obtained in the tomato crop on the Redlands Experiment Station to applications of molybdenum and to a lesser extent boron. Similar results have now been recorded at Stanthorpe on an entirely different soil type. Although plants may show no obvious symptoms of molybdenum deficiency, the yields are appreciably affected, mainly by the reduced size of the fruit.

BEANS.

The area under beans continues to expand, mainly to meet the increasing demand for winter greens both on southern markets and in Queensland itself. The area planted in autumn (1954) was, however, greater than usual. The area under crop in 1953 was 5,205 acres, from which 550,000 bushel cases were harvested.

About 100 acres of beans were planted in the Kingaroy district for the production of certified seed of the variety Brown Beauty. Weather conditions were, however, generally unfavourable and only two crops complied with prescribed standards for this commodity. Both were grown from special seed of Strain 17, a line selected recently for production because of its outstanding performance in trials at the Redlands Experiment Station. The results obtained during recent years in certified bean seed projects have been far from satisfactory and it is therefore proposed to revise the scheme.

Brown Beauty remains the dominant variety in the industry, though St. Andrew's is popular in the Gympie district. A locally selected mutant from Brown Beauty known as Langshaw's Beauty has attracted attention in some areas, mainly because of its excellent carrying properties; it is included in current trials at the Redlands Experiment Station.

Since the introduction of rust into Queensland some three years ago, the disease hazard, particularly in spring plantings, has increased. Studies are therefore being made, in conjunction with the Pathology Section, of the inherent resistance of Brown Beauty selections and some other varieties of French bean. In addition, a breeding programme designed to produce rust-resistant strains of French bean has been initiated.

LEAF VEGETABLES.

In 1953 about half a million dozen cabbages and cauliflowers were produced in Queensland. Varieties suited to the requirements of the several producing districts are the main interest at the present time. Recent work on the Redlands Experiment Station has clarified the position a great deal and shown that two varieties of cabbage, Mid-season Market and Enkhuizen Glory, produce moderate-sized heads of very good quality and are suitable for production in the Metropolitan area. Some of the quicker-maturing types such as Early Jersey Wakefield and Golden Acre are also well adapted to the Brisbane district, for they mature their crop very uniformly and land can be quickly allocated to another crop at the end of the harvesting period. However, these quick-maturing types are unlikely to find favour in areas located some distance from the market, owing to the brittle nature of the head, which makes careful handling essential both at harvesting and during transit.

The cauliflower crop is somewhat more hazardous than the cabbage, for the climatic requirements of the crop are rather precise. Some of the newer varieties tested at Redlands Experiment Station, such as Russia 2A, Snowball strains and All the Year Round, are rapidly coming into favour, mainly because they mature quickly; some of these varieties have the additional merit of self-covering which reduces curd blemishes to a minimum. Phenomenal 12 Weeks is rapidly going out of favour, but Phenomenal Early remains an attractive variety, being particularly suitable for the mid- and late-season crops. There is an obvious need for a longer cauliflower season in coastal areas, and a warm weather variety, Pua Kea from Hawaii, has been introduced for trial.

CUCURBITS.

Cucumbers are extensively grown in most market garden areas, the two main limiting factors to production being disease outbreaks and frost hazards, the latter being particularly important during the winter months. The best of the commercial types tested are Early Fortune and Marketer; Palmetto, a recent introduction with some resistance to mildew, has, however, proved useful in North Queensland.

Rockmelons are grown primarily for the summer trade. They are not a difficult crop to grow but harvesting the fruit at the right stage for any particular market is far from easy. Like the cucumber, the plant is very susceptible to molybdenum deficiency and corrective measures are essential in many soil types. Varieties which proved satisfactory in both yield and quality in 1953-54 trials were Hales Best and Sydney Market.

ROOT CROPS.

Supplies of root crops are usually adequate for requirements. One notable feature of the industry is the persistence of the bunch trade in carrots, the survival of which is an indication of the importance of consumer appeal in the marketed product. Chantenay Red Core, which has dominated the market, is gradually being displaced by types such as Osborne Park and Kurnella Intermediate, which have yielded heavier crops and have been less susceptible to motley virus in trials at the Redlands Experiment Station.

QUICK FREEZING OF VEGETABLES.

Quick freezing is a very satisfactory method of preserving vegetables, and information is now available on the processing techniques and the varietal suitability of the majority of Queensland vegetables. Best quality depends largely on a suitable variety, harvesting it at the correct stage of maturity and prompt freezing. Much of the experimental work this year has been concerned with blanching, which is necessary to prevent undesirable changes in colour and flavour during storage. More precise methods of determining the correct blanching times in steam or hot water have now been evolved.

MISCELLANEOUS TROPICAL CROPS.

Coffee plots at Kairi and Kamerunga Experiment Stations remain under observation. Results with this crop on the Atherton Tablelands leave little doubt that frost hazards in that area are too great for commercial production. At Kamerunga, however, the coffee grove is in good order; lack of effective shade was troublesome at the outset, but the bushes are now making rapid progress.

Pepper plants at Kamerunga established at the bases of trees in semi-cleared jungle have now commenced to flower and bear fruit, but the crop is not yet sufficient for processing purposes. Vines established from New Guinea cuttings are much more forward than those grown from Malayan cuttings.

EXPERIMENT STATIONS.

The Redlands Experiment Station is the focal point for advisory and research work on vegetable crops. The work in hand is concerned with varietal testing, varietal improvement, the maintenance of soil fertility, chemical weed control and irrigation methods. The Station maintains close contact with growers, which is evidenced by the increasing number of visitors. Although the Station is mainly concerned with vegetable investigations, stock-ecion trials in grapes, plant improvement studies in strawberries and varietal trials with avocados

are also undertaken. Supplies of water for irrigation are still far below requirements during the spring and early summer, but steps are being taken to remedy this.

Investigations at the Maroochy Experiment Station include plant improvement, plant nutrition, soil conservation, weed control, the use of hormones and other projects in pineapple, papaw, citrus and banana crops. The main improvements at the Station during the year has been the installation of irrigation equipment to use the water impounded in two dams constructed during 1952-53. It is now possible to plan the cropping programme well ahead and also to rotate crops around the property with greater freedom than in the past. Improved office accommodation has been provided in the packing shed for the technical staff on the property.

EXTENSION WORK.

Extension work is the responsibility of the advisory staff and also makes some claim on the time of the specialist staffs maintained in several horticultural districts.

Weekly articles in "Fruit and Vegetable News" ensure up-to-date news on current production matters and help to maintain close contact with the industry. The Committee of Direction of Fruit Marketing has co-operated with the Department in publicising field days and group discussions. Particularly successful ventures were a 3-day school for citrus growers in the Burnett district and a field day in the Granite Belt for deciduous fruit growers.

Advisory publications embracing many subjects are still in heavy demand, and re-issues of the more important publications are required every three years or so.

In conjunction with the Department of Public Instruction, school packing classes have been held in the Stanthorpe, Maroochy and Redland Bay-Cleveland areas. Keen interest has been maintained by the 427 children instructed and requests have been received for additional packing classes. The children compete at the district Shows for various trophies awarded to schools and to individual packers.

Colour movies of market faults in deciduous fruits and the handling and packing of bananas are in the course of preparation.

TRANSPORT.

The condition of fruits and vegetables consigned in louvered wagons from Brisbane to country towns in summer months cannot be regarded as satisfactory. Refrigerated transport which provides carriage temperatures 50°F. colder than louvered wagons is therefore an urgent necessity in a tropical State. Co-operative investigations during several summers have determined the suitability of certain types of iced wagons for the carriage of fruits and vegetables in Queensland. It has been concluded that refrigerated transport would be more widely used if consignments could be loaded direct from the market floor and cooled down during transit. This would avoid certain cartage and storage charges and the necessity to purchase consignments several days before the train is loaded. For this purpose, the ice capacity of the two types of wagons investigated will have to be increased and fans installed above the ice bunkers to circulate cold air through the load.

Fan cars are used extensively in the United States, and arrangements are in hand to import fan equipment suitable for Queensland wagons. The fan is operated by an alternator charged from a flexible drive attached to the axle. Experiments under Queensland conditions will still be necessary before the fan car can be recommended for commercial use.

FUMIGATION OF PRODUCE AGAINST FRUIT FLY.

Work has been initiated on sterilizing produce with ethylene dibromide as a means of killing Queensland fruit fly in infested consignments. For this purpose valuable equipment provided by the Committee of Direction of Fruit Marketing has been installed in Brisbane

and Toowoomba. At the former centre the quantity of fumigant absorbed by the produce, and its effect on the produce, are being determined. At the latter centre the lethal effect on the fruit fly throughout its life history is being studied.

Much of the initial work has been concerned with evolving suitable chemical methods for the rapid and accurate determination of the fumigant. Considerable difficulty has been experienced in maintaining a constant concentration of fumigant in the experimental cabinet because of the reactive properties of the fumigant and its penetrative powers. The critical factor in fruit fly destruction in infested produce is the quantity of gas absorbed by the produce; this cannot be controlled unless the concentration of fumigant in the storage atmosphere can be maintained at a constant level. If ethylene dibromide will kill fruit fly without injuring produce, then it may result in the removal of certain quarantine restrictions now operating against Queensland produce.

MARKET INSPECTION.

Dry conditions during early summer prevented deciduous fruits attaining full size, and in consequence certain tolerances were permitted to enable the crop to be marketed. Cyclonic conditions at the end of the summer resulted in heavy windfalls of apples and a temporary glut of bananas. The general condition of fruits and vegetables arriving at the Brisbane market has been satisfactory but there is still room for improvement in packing and labelling. In some cases, the poor presentation is due to lack of knowledge of market requirements, and a market advisory service has therefore been instituted. Copies of infringement notices are forwarded weekly to field officers, and wherever possible, growers are given personal instruction in handling and packing.

Disposal of inferior apples through the private order trade has caused some concern as attempts have been made to dispose of windfalls by this method. Rail inspection in the Granite Belt has had to be intensified, and condemnations have been heavy.

OVERSEAS EXPORT.

Prospects for apple export were particularly bright at the beginning of the season and plans were well advanced for a large shipment of early apples to the United Kingdom. However, the difficulty of obtaining suitable shipping space, the low prices being offered for export fruit and the cyclonic conditions which affected the apple crop have been restricting factors. Approximately 17,000 cases of apples exported to the East during 1954 arrived in good condition.

The quality of cases submitted by some exporters has been unsatisfactory, and many cases have been rejected for blue stain, mildew and thinness of timber.

PLANT QUARANTINE.

Commonwealth Plant Quarantine Regulations now decree that all outside cases, crates or containers made wholly or partly of wood, bamboo, cane or similar material must be inspected. This has increased quarantine duties considerably, as many such containers are imported annually from overseas. In order to reduce the quarantine work involved in the collection of inspection fees and the submission of importers' notices, arrangements have been made with the Department of Trade and Customs for quarantine officers to release the entire cargo of one ship instead of individual consignments. Although this inspection service has been in operation for only two months, 65 containers infested with timber wasps and beetles have had to be destroyed. Inspection of migrants' luggage has resulted in seizure of many prohibited imports.

Additional restrictions have had to be imposed on the importation of gladioli bulbs, as recent importations have contained diseased corms.

Fumigation of plants has been facilitated by the erection of a vacuum fumigation plant at the Commonwealth Fumigation Station at Lytton and a smaller plant at the New Farm fumigation depot by the Commonwealth Department of Health.

SCIENCE BRANCH.

Botany Section: Mr. S. L. Everist, Government Botanist.

Entomology Section: Dr. W. A. McDougall, Chief Entomologist.

Plant Pathology Section: Mr. J. H. Simmonds, Chief Pathologist.

BOTANY SECTION.

Mr. W. D. Francis, who has been Government Botanist since 1950, retired on 30th June, 1954. Although Mr. Francis will be remembered chiefly for his work on rain-forest trees, he also made valuable contributions to our knowledge of native poisonous plants. His work on iron bacteria and the role of iron in the origin of life is, perhaps, better known overseas than in Australia.

An interesting feature of the work of the Botany Section has been the experimental spraying of brigalow with hormone herbicides. Although the work is far from complete, results to date have been so promising that graziers and private firms have treated many thousands of acres of brigalow country by this method. The possibilities of further expansion are very great, since the brigalow country is a large area of potentially valuable land which at present is being only partly utilized.

Work in the Section may be considered under four headings:—(1) identification of plants; (2) research into the taxonomy of plants, both native and naturalized; (3) advice to Departmental officers and members of the public on matters relating to plants; and (4) field studies of particular problems.

IDENTIFICATION OF PLANTS.

The number of specimens received for identification remained steady at about 10,000 for the year. Of these, about 25% were from Departmental field officers, 30% from farmers, graziers and home gardeners, 30% from other State Departments, and 15% from Commonwealth Departments, mainly C.S.I.R.O. Most of the specimens from field officers and the general public were plants of economic importance, a great number of them weeds. Those from other Departments and C.S.I.R.O. were more general collections and many of them demanded critical examination, sometimes necessitating revisionary work in particular groups. Specimens collected by members of the staff are not included in the number quoted. These, too, required the same detailed examination.

TAXONOMIC STUDIES.

Critical studies were carried out on the taxonomy of the Proteaceae of the rain-forests, many of which are trees of economic importance. The species of *Macadamia* were included in the study. Intensive field work on this group was undertaken in co-operation with Dr. J. H. Beaumont of the University of Hawaii, who spent some time in Australia investigating the wild and cultivated races of *Macadamia*, commonly called the Queensland nut in this State. These joint investigations have led to a clearer understanding of the limitations of the species and their economic potentialities.

Work proceeded steadily on the honey flora of south-eastern Queensland and 24 species were described and illustrated. The preparation of this work involved research into the nomenclature of local species of *Eucalyptus* and the precise delimitation of the species.

Assistance was sought by the Forestry Department in determining why certain stringybark timbers from the Emu Vale district were proving unsatisfactory in buildings. A critical study of the trees involved was made in the field and in the herbarium. It was established that the unsatisfactory timber came from *Eucalyptus obliqua*, a species of stringybark closely related to but different from those which produce useful timber in this State. This species had not previously been identified in Queensland. As a result of this work it has been possible to prohibit by name the use of the offending timber.

Taxonomic work on grasses was continued. It is important to know the exact identity of grass species, particularly those utilized in pastures. For example, buffel grass shows great promise for improving pastures in the semi-arid regions of the north-west and central-west and in the Burnett district, but there is considerable confusion in nomenclature and the identity of different species is not clear. Until this confusion is resolved

it is not possible to apply with confidence the findings of workers in other parts of the world. The work of unravelling the tangled taxonomy of this group of species was begun but it is not yet complete.

A study of the *Lespedeza* species, native and naturalized, has revealed that the plant common in Queensland and thought to be identical with Korean *lespedeza* does not in fact belong to that species. In the United States, Korean *lespedeza* is a pasture plant of great importance, whereas our common species is not. It is obvious, then, that further work on Korean *lespedeza* in this State may be of some value.

ADVISORY SERVICES.

Apart from information asked for about the specimens sent in for identification, there was a constant flow of requests for advice on weeds, poisonous plants, shade trees, fodder trees and garden plants. A large number of personal and telephone enquiries was also dealt with during the year.

FIELD WORK.

Brigalow Control.

Following earlier experiments, a comprehensive series of experiments on aerial spraying of brigalow was begun. These experiments were designed to determine the most effective chemical, the most economical rate of application, the best time of year to do the work and whether oil was better than water for mixing the chemicals. They are not yet complete, nor will it be possible to make any final assessment of results within about two years. Both brigalow suckers and virgin scrub were treated in each of two localities, Tara-Condamine and Wandoan-Taroom. Each experimental block consists of 16 parallel treated strips 50 chains long and 2 chains wide separated by untreated buffer strips $\frac{1}{2}$ chain wide. Eight of these blocks were treated during the year, four in November 1953 and four in March 1954. Times of application coincided with periods of active growth of the brigalow. The third and last treatment in this series is to be carried out in July 1954, at a time when the trees are dormant. Three chemicals were used, viz., mixed esters of 2,4-D and 2,4,5-T, butyl ester of 2,4,5-T and butoxyethanol ester of 2,4,5-T. The first was applied at rates of 1 lb. and 2 lb. acid equivalent per acre and the last two at $\frac{1}{2}$, $\frac{3}{4}$ and 1 lb. per acre. They were dissolved in oil and emulsified in water, giving a total of 16 treatments in each block. Each of the 16 plots was 10 acres in area.

Although no final assessment of results is yet possible, the areas treated in November 1953 confirmed the earlier observations that defoliation is rapid following spraying in the late spring. Immediate effects differed not only with the rate of application but also with locality and the state of the plants at the time of spraying. In more northerly areas, where the trees were in more vigorous growth, no very great difference was observed between oil-based materials and those emulsified in water, but in the more southerly districts the oil-based materials gave a far better initial defoliation, particularly with low concentrations of chemical.

Another experiment was carried out on very young brigalow suckers with hormone weedicides applied with a jetting plant. These suckers were approximately seven weeks old. They were treated with similar chemicals to those used in the aerial spraying trials at similar rates of application. All were emulsified in water. Another part of the paddocks used for this experiment was sprayed by aircraft at about the same time.

Eucalypt Control.

Experiments on the use of hormone weedicides for treating eucalypts were begun at "Brian Pastures" in co-operation with the Agriculture Branch. Results cannot yet be assessed but preliminary observations indicate that 2,4,5-T may be useful for treating bloodwood and ironbarks. There also appears to be some prospect of using some 2,4-D and 2,4,5-T preparations

for the control of young seedlings and suckers by overall spraying. Further observations are needed to confirm this.

Weed Control.

At Peak Downs there is a weed problem peculiar to the area in that several native pasture plants have become very troublesome weeds in the areas being cultivated for grain sorghum. The chief species are *Polymeria longifolia* and *Teucrium integrifolium* (both known locally as Peak Downs curse), *Solanum ellipticum* (a potato weed), *Haloragis heterophylla* var. *glaucifolia* (perennial raspweed), *Rhynchosia minima*, *Glycine tomentosa*, *Glycine falcata* and *Achyranthes aspera* (chaff flower). These plants are deep-rooted perennials which spring up from below plough depth. With the conservation of moisture consequent upon following they grow very vigorously and make it necessary to cultivate with disc implements in order to kill them. These extra cultivations result in loss of moisture from the surface soil and sometimes mean the difference between being able to plant and not being able to plant. In co-operation with officers of the Queensland Government Central Queensland Estates, experiments were designed to test the effects of hormone weedicides on these plants and to explore the possibility of using chemicals as a substitute for one or more cultivations. If this could be done it would allow better conservation of soil moisture.

Botanical Surveys.

Botanical surveys were made in connection with studies of wallum country being carried out by the Chemical Laboratory. In conjunction with officers of the Division of Animal Industry, botanical surveys were made in the areas in north-western Queensland where "walkabout" disease in horses is known to occur. These tended to confirm the suspicion of the Western Australian workers that *Crotalaria retusa* is a common cause of this disease, but produced some evidence to suggest that it is not the only species capable of doing this. Cases of suspected plant poisoning in the Maryborough and Gympie districts were also investigated and further

field work was carried out on the plants associated with "wallum" disease in cattle, both in the south-eastern part of the State and in the area north of Townsville. A botanical survey was made of paddocks in the Richmond district being used for experiments on copper deficiency of sheep.

Pastures.

In co-operation with the Agriculture Branch, studies were begun in north-western Queensland of the replacement of native pasture grasses by buffel grasses and the possibilities of accelerating the process by deliberate sowing. It was obvious that at least one strain of buffel grass is admirably suited to the red-brown soils in these districts and that it is greatly superior to the native plants. The possibilities of increased production from this area if buffel grass could be more widely established are very great.

HERBARIUM.

A complete rearrangement of the herbarium was begun in order to make greater use of available space and to simplify the work of the Section. Mounting of specimens has made some progress and type specimens are being placed in distinctive folders during the course of normal work in the herbarium. This will make segregation easier should it ever become necessary.

Exchange of specimens was continued with other herbaria, principally the Royal Botanic Gardens, Kew; New York Botanical Garden; Arnold Arboretum, Boston; Rijksherbarium, Leiden; Bogor Herbarium, Indonesia; Forestry Herbarium, Lae; Australian Herbarium, Canberra; National Herbarium, Melbourne; and National Herbarium, Sydney.

Visiting botanists who worked in the herbarium during the year were Dr. A. J. Eames, Cornell University, U.S.A.; Dr. J. H. Beaumont, University of Hawaii; Mr. J. S. Womersley, Lae; Mr. R. Specht, University of Adelaide; Dr. R. D. Hoogland, Mr. R. Perry and Mr. M. Lazarides of Canberra.

ENTOMOLOGY SECTION.

During the year, entomologists were stationed at Rockhampton and Stanthorpe, and six field stations now provide a local service to most coastal districts. As part of the investigational programme considerable insecticide screening was again undertaken. It is becoming increasingly evident, however, that this time-consuming work must be restricted in the future, otherwise more important aspects of economic entomology will suffer. Dosage levels trials with some of the older and proven insecticides against several pests yielded worthwhile commercial results, and Departmental recommendations have been modified accordingly.

GENERAL.

With less than average spring rainfall, a heavy wet season during February, and comparatively dry weather in autumn, no unusual and widespread insect pest infestations other than by the caterpillar *Prodenia litura* (F.) were experienced. Increased populations of some pests, however, caused local concern, and these are discussed under relevant headings.

DECIDUOUS FRUITS.

Spray schedules have kept economic losses by codling moth (*Cydia pomonella* (L.)) and mites to a satisfactory minimum. The grape vine moth (*Phalaenoides glycine* Lew.) has been prevalent and caused some severe defoliation. Field trials over the past two seasons have demonstrated that the new organic sulphur miticides show little promise in improving mite control in the Stanthorpe district. Some other chemicals gave good kills of only one or two of the species present. E605 is still the best all-purpose miticide when used as part of the recommended schedules. A trial using various materials against the green peach aphid (*Myzus persicae* (Sulz.)) has been completed. The addition of lime sulphur, DDT or E605 to semi-dormant oil did not improve the control of this pest.

In the Pinkenba area, trials were established using several insecticides, including Hanane and Systox, against the grape mealy bug (*Planococcus citri* (Risso)) and phylloxera (*Phylloxera vitifoliae* (Fitch)),

and with soil insecticides in a peach orchard against the root channeller (*Leptops setosus* Lea). The infestation in the last-mentioned trial was negligible but poor tree growth warranted further attention. Analyses of foliage indicate boron deficiency, and it is now of interest whether the insect is an important primary pest or a secondary pest.

TROPICAL FRUITS.

Long-term soil insecticide trials against the banana weevil borer (*Cosmopolites sordidus* Germ.) have been continued; preliminary investigations of mite damage at Nerang and Moggill have been made; and a schedule for the control of banana pests has been circulated. A mite, *Tetranychus pacificus* McGr., was found on papaws at Sunnybank, and this is the first Queensland record of the species. Some further survey work in pineapples was carried out.

CITRUS.

Red scale (*Aonidiella aurantii* (Mask.)) populations were heavy in most of the drier areas of the State, but the more general use of double spraying during December will improve the control of this pest in orchards and home gardens. Large-scale trials were again established in the Gayndah district.

Due to parasitism there has been a marked reduction in gall wasp (*Eurytoma fellis* Gir.) infestations, and it appears that this insect may be returning to the status of a minor pest. Further field trials using various systemic insecticides and methods of application have been completed. It is now confidently expected that, if required, a satisfactory chemical control for gall wasp will be available.

In the Nambour district, quantities of mid-season fruit were blemished by maori mite (*Phyllocoptruta oleivora* (Ashm.)), and in some other districts a heavy build-up of white wax (*Ceroplastes destructor* Newst.) was experienced. The bronze orange bug (*Rhoecocoris sulciventris* (Stal.)) was noticeable in several areas. In general, good control of these pests is being obtained with a reasonable amount of timely spraying.

Detailed life history studies have been continued, and a survey of citrus pests was carried out in the central and far northern portions of the State.

FRUIT FLIES.

Infestations, although not as severe as in some years, were fairly general and erratic. As examples, these pests were troublesome in the Brisbane area during the winter of 1953, and in late August were damaging custard apples; in the Toowoomba district tomato crops were almost a total loss throughout February and March, when green fruit were stung. Fairly satisfactory commercial control was obtained in many commercial orchards, and again particularly in citrus.

Investigational work covering a wide field and giving profitable leads towards improved economic control has been continued and expanded. This includes ecology, taxonomy, insecticide screening, field trials, continuous trapping in several coastal districts, and parasite recording.

TOBACCO.

The looper (*Plusia argentifera* Gn.) was a pest in most districts, but the large populations experienced in the previous season were not present during the main cropping period. The leaf miner (*Gnorimoschema operculella* (Zell.)) and cluster caterpillar (*Prodenia litura* (F.)) were active in some coastal crops, and eriophyid mite damage was appreciable in the Inglewood district. The major pest during this past season was the bud worm (*Heliothis armigera* (Hb.)) which was not adequately controlled by the use of dieldrin, and various DDT-dieldrin mixtures were commonly used.

The investigational programme included work on arsenic residues; large-scale field trials against nematodes (*Meloidogyne* spp.) and the insect pest complex; ants (*Pheidole anthracina* Forel) damaging seedlings; and insecticide screening, taint tests, and solvent phytotoxicity. Results clearly demonstrated that practical pest schedules may increase tobacco yields fourfold over those from poorly protected crops; endrin is an improvement on dieldrin for looper control, and also gives promise as a general insecticide in tobacco fields; and DD or EDB treatments, correctly applied, are necessary and profitable for nematode control.

GRAIN.

Experiments with protectant dusts against stored grain pests have been completed. Various BHC dusts are now recommended for treating seed grain and grain for stock fodder. A pyrethrum-piperonyl-butoxide dust gives reasonable protection to clean whole grain for poultry food. An account of the work on which these recommendations are based is being prepared for publication.

LOCUSTS AND GRASSHOPPERS.

Early reports of hopper swarms of the Australian plague locust (*Chortoicetes terminifera* (Walk.)) were received from widely scattered localities; in September, *Locusta migratoria* (L.) was noticeable at Thangool and Monto; a few small swarms of *Gastrimargus musicus* (F.) were seen at Raglan; and adults of *Austroceris guttulosa* (Walk.) were present as swarms at Gindie. During December a small amount of local spraying with BHC was undertaken in some areas. By late summer in most districts locusts were not particularly noticeable.

VEGETABLES.

Mites were active on tomatoes in the Ayr district during August, and *Heliothis* sp. damaged this crop around Rockhampton in September. The brown vegetable weevil (*Listroderes obliquus* Gyll.) was present in several crops in a number of districts in late July, and *Myzus persicae* (Sulz.) infested lettuce on the Darling Downs. Heavy infestations of crucifers by the aphid *Brevicoryne brassicae* (L.) were experienced in southern areas, and seedling cabbages, if not sprayed or dusted, were killed by this pest. Although the cabbage white butterfly (*Pieris rapae* (L.)) was prevalent in some districts, damage was reasonably well controlled. In December this pest was recorded from Bibbohra, North Queensland.

Screening tests using several of the newer miticides against red spider (*Tetranychus urticae* Koch.) on beans demonstrated that none of these materials is of

value in controlling this pest. Results of detailed phytotoxicity trials with insecticide solvents on tomatoes and cucumbers indicate that better specifications for these materials are a necessity before further work on this subject in any crop is attempted. Various trials with the several cabbage pests were concluded, and a DDT-BHC dust was the best material for general commercial use against pests of this crop. Parasites of the green vegetable bug (*Nezara viridula* (L.)) were liberated in the Pinkenba area.

MISCELLANEOUS FIELD CROPS.

An outbreak of the blue oat mite (*Penthaleus major* (Duges)), mostly in barley and wheat on the Darling Downs, provided an opportunity for field control trials with dieldrin, DDT and BHC. DDT applied at the rate of $\frac{1}{4}$ lb. per acre reduced the pest populations to a very low level. Sorghum midge (*Contarinia sorghicola* (Coq.)) was prevalent in most districts by early March, and in many crops secondary heads were destroyed. Laboratory studies with this pest have been continued, but field work was seriously hampered by floods. *Homoeosoma* sp., the yellow peach moth (*Dichocrocis punctiferalis* (Gn.)) and *Monolepta australis* (Jacoby) as pests of sorghum were given attention. The ant *Pheidole ampola* Forel was widespread on the western Darling Downs and in other areas, where it attacked germinating grain. Jassids were prevalent in lucerne crops in the Lockyer Valley during autumn, and field trials were established: DDT gave the best pest kills.

In south-eastern Queensland during late February and March grass grubs caused extensive damage to pastures and improved grass areas. This season the cluster grub (*Prodenia litura* (F.)) was the most important component of the pest complex, which included *Psara leucisalis* (Walk.) and various cutworms and loopers. Parasitism was low but DDT promptly applied at the rate of $\frac{1}{4}$ lb. per acre gave satisfactory control in all instances. Trials with some of the newer insecticides against these pests were completed. The investigation of a number of pasture white grub problems has been commenced. As one of the preliminaries, pot tests with BHC against third stage *Rhopaea* sp. that damages dairy pastures on Mount Tamborine were undertaken. Heavy and uneconomic dosages thoroughly mixed with the soil gave negligible kills after one month.

MISCELLANEOUS.

Control of potato pests is now generally satisfactory. Early in October a heavy infestation of *Plusia* sp. infested a potato crop near Boonah: a field trial was forestalled by heavy parasitism by two species of Braconidae. Floods interfered with experimental work in cotton, and *Heliothis* spp. were responsible for heavy losses in some areas. Large-scale control trials against the gladiolus thrips (*Taeniothrips simplex* (Mor.)) were carried through at Brisbane and Toowoomba: useful information on systemic poisons was obtained, and satisfactory control of this pest by several materials and methods of application has been formulated.

In pot experiments Systox treatments gave good results against the chrysanthemum nematode (*Aphelenchoides ritzei-bosi* (Schwartz) Goodey). Two adults of the white-fringed weevil (*Pantomorus leucoloma* (Boh.)) were taken in a Toowoomba garden. An orchid pest at Cairns which tunnels into stems, roots and leaves has been identified as a Malayan species of weevil (*Orchidophilus aterrimus* Waterh.). Windbreak plantings of eucalypts on many Darling Downs properties were attacked during July and August by the leaf-mining sawfly (*Phylacteophaga eucalypti* Frogg.).

Animal casings held in storage in Brisbane became infested by the mite *Aleuroglyphus ovatus* Troup., and control with DDT was not successful. *Duboisia leichhardtii* (F. Muell.), which is grown commercially in the Proston area, was attacked by the hawk moth (*Coenotes eremophilus* Luc.). Bagworms (*Hyalarcta hubneri* (Westw.)) have been troublesome in plantations of *Pinus patula* Schlechtend. and Cham. at Passchendale, and a lead arsenate spray was applied to several areas where the pests were in large numbers. Studies on the habits and taxonomy of Coccoidea and Agromyzidae have been continued.

A survey was made of the sandfly problem at Abercorn. Waves of *Austrosimulium pestilens* M. & M. were recorded after the first flooding of Half Moon Creek, and populations were heavy. Some

field work was undertaken to reduce attacks by crows on planted maize seed at Conondale. An inspection was made of severe damage by a native rat to reafforested areas in the Yarraman district, and a control schedule with "1080" has been outlined for the winter and spring of 1954.

BEEKEEPING.

The year was not favourable for honey production, as prolonged dry weather was followed by cyclonic disturbances which destroyed bud and flower growth of nectar-producing flora. At March 31 there were 1,017 registered beekeepers in the State, the largest number since beekeeping legislation was introduced. Extension and routine inspectional work covered 57 localities, and attention was given to 8,132 hives, in 195 apiaries.

American foul brood (*Bacillus larvae* W.) was found in nine hives in two South Brisbane apiaries. Two consignments of queen bees from U.S.A. were infested with *Nosema apis* Zander, and one from Cyprus with the bee louse (*Brachycaea* (Nitz.)): all were destroyed. At Burpengary and Greenbank, 105 hives in two apiaries suffered adult losses from an unknown cause.

PLANT PATHOLOGY SECTION.

This year saw two new glasshouses in commission and their value has already been demonstrated by the expansion of critical work which has been made possible. This was especially noticeable in the field of virus diseases.

A feature of the year's work has been the attention given to developing varieties resistant to diseases not readily controlled by normal means. This method is being attempted in the case of bean rust, stem rot of cowpea, Fusarium wilt of the passion vine and dieback of papaws. These and other items of pathological interest are discussed below under the names of the respective hosts concerned.

CEREALS.

In spite of the dry conditions in the early part of the season, Rhizoctonia root rot and Fusarium crown rot were both responsible for economic losses in the wheat crop. Plants affected by the former may recover under good growing conditions but maturity is delayed and yield reduced. Fusarium crown rot produces empty heads and this season was apparently not associated with frost damage.

Sorghum.

Investigations directed to determining the range of diseases affecting species of *Sorghum* in Queensland have revealed two organisms hitherto unrecorded in Australia. These are *Gloeocercospora sorghi*, which has a very restricted host range, being confined to the grain sorghum varieties Plainsman and Caprock, and *Ramulispora sorghi*, which attacks a wide range of grain and sweet sorghums, Sudan grass and *S. almum*. It would appear that *R. sorghi* is a recent introduction to Queensland. Both organisms cause extensive leaf damage to the varieties they infect.

It has been found that sorghum head smut (*Sphacelotheca reiliana*) is now more widespread than in the 1952-53 season, although on individual farms it generally occurs in trace proportions. The fact that heads on secondary tillers only were infected in early plantings while primary heads developed the disease in later plantings of the same variety indicates the importance of an environmental factor such as temperature.

The host range of *Colletotrichum graminicolum* has been extended in Queensland to include the grain sorghums, Sudan grass, Johnson grass and broom millet.

FIELD CROPS.

Cowpea.

Stem rot (*Phytophthora* sp.) of cowpea was again serious in the third season since its first appearance. The early work on varietal resistance has been followed up by testing over one hundred varieties, obtained from overseas and local sources, under both glasshouse and field plot conditions. The varieties Black Eye 5, Chinese Red and an unnamed introduction have shown almost complete resistance to the disease. Others, including the locally grown Cristaudo, have shown high resistance in field plots and moderate resistance in the glasshouse.

The project concerned with the honey flora of south-eastern Queensland has been continued, and further articles covering 24 nectar-producing trees and plants have been published.

FAUNA AND FLORA PROTECTION.

During the year, 14 honorary protectors and three honorary rangers were appointed. One honorary protector and one honorary ranger resigned.

At the invitation of Naval authorities, and in the interest of fauna conservation, training exercises conducted near the Bunker Island Group sanctuary were witnessed by a Departmental fauna officer.

Five prosecutions for shooting on sanctuaries and dealing illegally in protected fauna were recorded, and five firearms were confiscated.

"The Fauna Conservation Act of 1952" was proclaimed on January 1, 1954, and implementation has proceeded satisfactorily. To the end of June, 435 open season permits, 25 skin dealers' licences and 8 fauna dealers' licences have been issued, and preliminary attention has been given to other aspects of fauna conservation with which this legislation is concerned.

Another group has shown marked resistance in the field plots although proving highly susceptible in the glasshouse. The more promising varieties will undergo further trials under field conditions.

Tobacco.

An experiment designed to ascertain whether field mould (*Peronospora tabacina*) could be economically controlled by either copper oxychloride or ziram produced inconclusive results and needs to be repeated.

DECIDUOUS FRUIT.

A further experiment on the control of brown rot in peaches in the Stanthorpe district supported previous work here and in the southern States by showing that the organic fungicides thiram and ziram are satisfactory substitutes for lime sulphur. S.R.406, although somewhat more efficient, caused russetting of the fruit at the strength used.

SUBTROPICAL FRUIT.

Citrus.

Detailed investigations have been carried out in connection with an extensive outbreak of collar and root rot in the Kennedy district of North Queensland. Many trees have been completely destroyed and others rendered uneconomic. Isolations from diseased trees have yielded *Phytophthora parasitica*, an organism distinct from the one (*P. citrophthora*) responsible for a similar trouble in southern States. In an inoculation experiment designed to show the relative susceptibility of a number of citrus varieties to the fungus, it was shown that this is not the same as for *P. citrophthora*. Further work will therefore be necessary before recommendations can be made for a suitable rootstock. In the affected area it appears that rough lemon stock is somewhat resistant and that low planting aggravated by low budding has often been responsible for the incidence of the disease in trees worked on this stock.

In citrus storage trials, sodium orthophenyl phenate plus hexamine gave good control of blue mould but was less effective against stem end rot (*Phomopsis citri*). With 1% salicylanilide in wax emulsion the position was reversed, while the standard 4% borax-2% boracic acid dip was intermediate between these two.

Strawberry.

Applications for inclusion in the strawberry runner approval scheme numbered 14 from the metropolitan area and 10 from the north coast. Of these, 5 and 8 respectively were finally approved. Poor growth and associated low yields due to drought conditions were responsible for withdrawals in a number of cases. The scheme is proving effective in reducing the incidence of virus diseases to negligible proportions when approved runners are planted.

Passion Fruit.

Work on Fusarium wilt of the passion vine has demonstrated the relative resistance of additional species of *Passiflora*. Grafting *P. edulis* onto

P. javicarpa, one of the less susceptible species, has been attempted with success. This may prove of some practical importance in view of the difficulty so far experienced in obtaining strains of *P. edulis* itself resistant to the disease.

TROPICAL FRUITS.

Banana.

Investigations into the control of banana leaf spot (*Cercospora musae* and *Cordana musae*) in North Queensland have been expanded by the initiation of two further experiments in the Cairns area. These involve the use of five different fungicides, in one case comparing the result of five applications per year with that of nine, and in the other comparing schedules commencing at different stages of plant growth.

Some modification has been made to the conduct of the Lady Finger approved planting material scheme whereby the officers of the Horticulture Branch are now responsible for the field inspections and officers of this Section are only called upon for specialist advice. The scheme has now been operating for a number of years and it appears to have put an appreciable check on the spread of Panama disease.

Pineapples.

In an attempt to obtain a satisfactory dip for the control of water blister (*Thielaviopsis paradoxa*), 1% salicylanilide in wax emulsion reduced a mean infection of 39.9 in untreated fruit to 4.9. The equivalent infection in fruit treated with 1% thiram was 16.6. The use of salicylanilide dip should be regarded as an emergency measure only and should not be substituted for control by practising hygiene.

Work on the etiology of isolated wilt has continued. *Phytophthora cinnamomi* has been isolated from very early stages of pineapple root decay but is difficult to obtain from the rotted roots of the typical wilted plant. With the latter material, a root lesion nematode is commonly associated. Work is now proceeding to determine whether either of these organisms is responsible for the disease.

Papaw.

Following on the dieback resistance trial at Aspley, seeds from some selections showing evidence of resistance have been planted in a further trial at the Redlands Experiment Station, where they will be subjected to natural infection with the disease.

Attention has been paid to developing suitable techniques for handling the virus diseases of the papaw under controlled conditions and considerable progress has been made with grafting.

The fungus *Corynespora cassiicola*, which is commonly associated with a spotting of the older leaves of papaws in North Queensland, was recently found causing a minor outbreak of spotting on immature fruit. The spots varied from a black speck surrounded by a water-soaked halo to large jet-black zonate spots up to an inch in diameter.

VEGETABLES.

Amongst vegetables, the French bean has received most attention. The occurrence in 1949 of a new physiological race of rust found Brown Beauty, the variety almost exclusively grown in Queensland, to be highly susceptible, with the result that this disease has risen from a position of minor to one of major importance. Early attempts to find a source of resistance to rust indicated that Californian Small White navy bean was highly resistant to rust race 17a, while the French beans Florida Belle and Landreth were resistant. In a more detailed experiment carried out last spring, these findings were confirmed and it was demonstrated that whereas certain selections of Brown Beauty show tolerance to the disease, none is likely to be useful for breeding purposes.

With this information as a basis and with the assistance of the Horticulture Branch, the three resistant types mentioned above have been crossed with Brown Beauty. The first of these hybrids has already been carried to the F₂ generation and a series of back crossings made to Brown Beauty selections known to possess anthracnose and mosaic resistance. Prospects to date appear very promising.

In order to obtain information on the inheritance of resistance to rust race 17a, about 120 single progeny rows of the third generation cross Brown Beauty

x Californian Small White were planted in between rows of the rust susceptible Pinto variety and the whole area infected with rusted bean leaves. A satisfactory infection occurred and individual plant ratings have been made which now await analysis.

A final trial of rust control by fungicides carried out in the Nambour district confirmed the superiority of sulphur dust to other materials used. Dusting with sulphur can be recommended where control measures of this nature are warranted.

Most summer plantings of beans were abandoned after heavy storm damage and several which survived suffered a more than usually serious attack of bacterial pod twist. Thrips infestation was associated in each case and the opportunity was taken to carry out glasshouse experiments to confirm the theory that thrips are responsible for spreading this disease in the field. The biochemical and morphological characters of the organism responsible for bacterial pod twist have now been fairly fully investigated and it is thought to be a new record for bean.

Vegetable growers often experience considerable losses and delay through damping-off of seedlings either in the seedbed or in the field. In order to gain more exact local information regarding the nature and prevention of this, a survey of the organisms responsible has been undertaken and a series of field experiments designed to test the relative efficiency of a number of old and some more recently developed methods of seedbed disinfection.

MISCELLANEOUS.

Six isolates of *Rhizopus* spp. from various hosts have recently been examined and it has been found that *R. arrhizus* Fischer is present as well as *R. nigricans* Ehrenb. *R. arrhizus* occurred naturally in relation to apricot fruit rot and pre-emergence rot of the peanut, but as it will experimentally infect strawberry, bean, papaw and custard apple, it may be present more frequently than has previously been realised in the summer months, when its high temperature range would be to its advantage.

Some interesting records of damage by *Sclerotium rolfsii* included a collar rot of custard apple seedlings at Bundaberg similar to that of apples at Stanthorpe, a foot rot of wheat at Gayndah and a base rot of lucerne at Davies Creek.

SOIL MICROBIOLOGY.

This year, full-time work on soil microbiology was allotted to an officer of this Section. First attention was given to ensuring that only the most effective strains of *Rhizobium* were being used in the Departmental inoculum service. For this purpose a large range of local and overseas isolates has been tested in glasshouse and field tests and further trials are in progress.

In order to increase the range of material to draw on, isolations have been made from introduced and native legumes in various habitats. At the same time, observations have been made on the extent of natural nodulation.

Rhizobium studies have been made on 26 species of native legumes in the wallum and heath areas nodulating in soils of low pH (4.4-6.6). In addition, isolations have been made from 19 other species from various other localities. Preliminary work suggests that the majority of these belong to the cowpea cross inoculation group. To this group there have been so far added seven species in genera already accepted in the group and four species from genera not previously classified.

Observations on tropical legumes as far north as Cairns have indicated an abundance of nodulation of an effective type.

The soil microbiologist is co-operating with the Chemical Laboratory and the Agriculture Branch in attempts to establish legumes in certain problem areas such as on the red soils of the Atherton Tableland and the acid coastal soils. This involves developing strains of *Rhizobium* effective on various legume species and under specific soil conditions.

Observation on Agriculture Branch field trials at Cooroy and Nerang has shown that a phosphate deficiency was the limiting factor in poor clover growth in these areas. In another trial at Tingalpa the type of nodulation was found to be affected by the form in which phosphate was applied.

CHEMICAL LABORATORY.

Dr. M. White, Agricultural Chemist and Biochemist.



Dr. M. White.

Whilst chemistry, in one or other of its many facets, enters into virtually every phase of the work of agricultural scientists, it is comparatively seldom that chemical results are the end point in any investigation. Rather the results are tools handed to others to assist in the solution of their problems.

Consequently, from the work of the chemical laboratory there is a great bulk of results expressed in terms such as animal health and production or enhanced plant yields, without disclosure of the thousands of chemical analysis and investigations which facilitated or even made possible the approach along entomological, pathological, culture or husbandry lines.

The basic chemical work may thus finally lose much of its significance and wide interest; therefore, while details would be of value to chemists they do not find place in this general account of the laboratory activities during the period under review.

For the most part, then, this report is confined to items which are self-contained in the sense that their application can be made directly and not be submerged into some wider field of investigation.

BIOCHEMISTRY.

The work of the Biochemical Section has been directed almost wholly towards the solution of problems of animal nutrition, and has been aimed more particularly at alleviating pathological or near-pathological conditions.

Fluorine.

Investigations over a period of years have demonstrated the ill effects on the teeth of animals of excessive amounts of fluorine taken into the body in the form of water-soluble fluorides. The cause of the defects has been known for some time, and the work of the biochemists engaged in this study lay essentially in two directions—location of offending waters, and devising methods of curing or ameliorating the trouble.

These investigations have now been concluded with the mapping of affected areas and working out of the essential points in a management programme which will mitigate, if not eliminate, the problem insofar as sheep are concerned. While sheep are not the only animals which may be affected, the occurrence of high fluoride waters is such that in Queensland's primary industry it is largely a problem of sheep areas.

Copper.

Biochemical enquiries concerned with copper have been of the opposite character to those recorded under fluorine. While it is known that excess copper is toxic to stock, in Queensland the problem with this element arises out of deficiency of supply. Our investigations have demonstrated that the deficiency occurs because in several soil types in Queensland the availability, and in some the total content, of copper is so low that the pastures are unable to absorb sufficient copper to supply the needs of the grazing animals.

The more normal methods of analysis are of but limited value in this work and this has added to the difficulty of precise diagnosis. A further abnormality arises in that the common first approach to such a problem is to so treat the soil as to ensure the uptake of the material by the plant. In the case of copper, however, a complication arises from the markedly different capacities of our common pasture species to absorb this element. Economic factors also intrude into the solution of this problem of copper deficiency.

The investigations, which are incomplete and will be continued, have so far disclosed the following points:—Administration of copper through drinking water can give excellent results; clover growth is stimulated when certain soil types are treated with appropriate copper compounds, and apart from increase in the amount of clover so produced this plant is able to absorb comparatively large amounts of the element, thus enhancing the benefits insofar as the animal is concerned.

Another promising avenue being explored is the building up of body reserves by direct administration of copper compounds either orally, intramuscularly or subcutaneously, so that the treated animal has sufficient stored to tide it over the periods when the quality and the quantity of pasture are low. This work has now passed the laboratory stage and has been extended to trials with both sheep and cattle on properties known to be deficient in copper.

Phosphorus.

Data accumulated over many years show that many Queensland soils are low in phosphate, and for some years the Biochemical Section has been studying the relationship between low phosphate soil and animal health. This work is handicapped by the necessity of performing analysis of blood samples within a matter of hours of the samples being drawn. Though the decentralisation of laboratory facilities may be of some help, in a territory the size of Queensland no practicable degree of decentralisation could overcome completely the time occupied in bringing the material to the laboratories for treatment. Accordingly, investigations were orientated towards devising methods other than the classical system of Green and Theiler, and it is gratifying to be able to report a measure of success. It now appears feasible that examination of the faecal phosphate fraction may be a highly satisfactory method of obtaining results.

Vitamin A.

A close examination of the more widely practised systems of calf rearing in the dairying industry suggests that the belief that lack of vitamin A is not serious in Queensland is unfounded. Consequently, a comprehensive programme has been drawn up to examine the question and a survey is now under way. It is considered that it is more feasible to check vitamin A and its precursors in butter than in pastures and in this way gauge the vitamin status of the weaned calf.

Riboflavin.

Insufficiency of vitamin B2 (riboflavin) in the laying hen and the growing chicken has been shown to be closely associated with poor hatchability, deformed chicks and "curled toe." Many cases of these disorders have come to notice in the course of investigations into poultry feeding. Firm diagnosis and establishment of cause have been of particular importance at this stage of our work, and accordingly study of techniques was required. This study has progressed so that it is now possible to confirm diagnosis by chemical analysis of liver samples.

CEREAL CHEMISTRY.

A wheat quantity survey was made two years ago. From the data it seemed advisable to examine in greater detail the characteristics of six leading varieties grown under a wide range of conditions. Only a small proportion of the planting took place at the beginning of the season and the prolonged dry weather made a second late planting inevitable. Results were quite unexpected. In previous years mottled grain always had a low protein content; this season's harvest showed a high incidence of mottling and a high protein content. It had been shown that the period at which nitrogen becomes

available to the plant greatly influenced results. For example, early availability gave more plant growth; availability at flowering increased protein content of the grain; but late availability did not influence grain protein. This was borne out in many cases where the late rain led to nitrate production in the fields where the crop was reaching flowering stage.

A protein level of 16.9 per cent. on a 14 per cent. moisture basis was the highest reached, but most grain tended to show an exalted figure.

This work is to continue.

GENERAL ANALYTICAL.

Stock Foods.

Prepared foods submitted for analysis come under two headings—(a) those coming from the Department's inspectorial services, (b) those from which poor results are alleged to have been obtained. The first represent the routine checks for quality while the second often invite further inquiry. Two interesting cases are quoted:

Salt is often added to poultry mashes. An excess causes dysentery and desiccation in birds and when these signs appear there is usually a call for salt estimation. Some very high levels were found when coarse salt either through faulty mixing or by gravitational separation had accumulated. Fine salt is recommended. Even when the salt level is within the prescribed limit, salt poisoning has occurred through the cumulative effect of saline water and treated food.

Perosis or "slipped tendon" in poultry arises in part from insufficient manganese in the diet. A number of tests on commercial foods indicates that where the mill offal and meal proportions are low, or when the maize or sorghum level is high, the risk of manganese deficiency is great.

Fodders.

Silage from the north-western sheep areas, bush hay from almost every quarter of the State, peanut trash and industrial by-products have been examined and their food values calculated. Two important cases are worthy of special mention.

A sample of *Psoralea eriantha*, a western legume, returned a protein content of 19 per cent. Admittedly it was the leafy portion, but this level corresponds with that of show lucerne. This suggests that the plant may find a very useful place, particularly where irrigation can be practised in inland parts.

Oil Seeds.

Sunflower seeds were analysed for oil content and it was shown that the level increased the further north the plants were grown.

Dips.

The increasing complexity of dip mixtures used for tick and buffalo fly control has become a cause for concern. The gradual replacement of arsenic by newer chlorinated compounds continues, and with this trend has come increasing difficulty in analytical work.

TOXICOLOGY.

The contamination of tobacco with lead arsenate following treatment against pests led to a comprehensive programme designed to show the quantity and frequency of application which were compatible with the requirements of the Health Acts. The chemical work only was done by the Toxicology Section. This work is now complete and the results ready for publication.

The obvious time to attempt removal of excess insecticides would be prior to curing. Experiments were instituted in which various physical and chemical operations alone or in combination were employed. The leaf was then cured and assessed for damage. The results showed that heavy contamination could be successfully removed; the leaf damage was appreciable, but curing presented no difficulties. However, there was a marked deterioration in quality and the labour cost was high. Prospects of mechanisation are not attractive.

Deaths from careless disposal of arsenic and lead again represented the bulk of routine examinations. An unnecessary risk which brings its quota of poison cases is the dirty drum sent to be filled with molasses. All sorts of containers are used and many have previously held phenols, paint dryers, arsenic and other poisonous material. Never use a dirty drum for molasses.

Following reports of thallium poisoning in New South Wales, a number of suspected materials was submitted. Millions of thallium-treated baits have been used in Queensland, yet only one death in domestic animals has been proved to be due to thallium.

Other materials examined in connection with deaths in livestock contained nitrates, prussic acid, phosphorus and strychnine.

A programme designed to follow the paths by which certain plant poisons are detoxified in the animal and so provide a clue to treatment has been commenced.

PLANT NUTRITION SECTION.

Soil Surveys.

Burdekin.—Most of the Burdekin land surveyed is in the Dalbeg section, extending from Expedition Pass Creek in the north to Pink Lily Lagoon in the south, embracing an area of approximately 4,500 acres. A report on the characteristics of the soils was compiled and a soils map prepared. In addition to the normal mapping of soil types, a land usage grouping is made to facilitate planning by the Irrigation and Water Supply Commission.

Mareeba-Dimbulah.—Field work in the Mareeba-Dimbulah district was commenced last year at Rocky Creek—an area of 5,000 acres. This was finished in the first half of the financial year and a report and soils map have been prepared for the Irrigation and Water Supply Commission. In addition, field work of the Granite Creek section of 10,900 acres is complete and mapping is well advanced.

Other detailed surveys completed are the new experiment station at Parada (600 acres), the Animal Husbandry Research Farm at Rocklea (350 acres), and portion of the Field Station at Coolool (approximately 400 acres). Two detailed reconnaissance surveys associated with minor irrigation projects at Emerald and Barcaldine were made.

Wallum Investigations.

Two areas originally covered with *Banksia acmula* are now planted to pineapples. The first section was planted to slips in September 1953, and the second to tops in March 1954. Both are doing well, although isolated plants of the slip planting showed crookneck (copper-zinc deficiency). These have recovered following treatment.

A 3×2×2 fertilizer trial with para grass has been established on heath country and two pasture variety trials are laid down on ground slightly more elevated than the heath. No significant yield differences have been obtained to date from the para grass fertilizer trial which was established to study the effects of dolomite and trace elements. The establishment of legumes in this has been difficult, due largely to very hot dry weather following germination and certain difficulties associated with nodulation. This nodulation problem is being investigated by the soil microbiologist of the Plant Pathology Section.

One of the variety trials includes five summer grass species oversown with legumes and the other winter grasses and winter legumes. The grasses have done well in the summer variety trial, although suffering at times from nitrogen deficiency. This appears to be made more acute by the salt-laden winds which sweep the area during early summer. Winter grasses and legumes are looking well.

Larger areas of heath country are at present being contour-surveyed for drainage and cultivation with a view to the establishment of pasture for grazing trials. A large number of grasses and legumes has been tried in pilot plots. Fodder trees which did well when first planted suffered a severe setback from the hot salt-laden winds last summer.

Plant Nutrients and Toxins.

Chlorine injury, particularly in tobacco, has continued to be the most common cause of poor plant growth arising from excess of an injurious element in the soil or water. Tobacco leaf obtained from both Clare and Inglewood was found to contain much more chlorine than desirable, and it would appear that the upward movement of native soil chlorides must be responsible for a lot of the chlorides absorbed by the plant. The result of two seasons of irrigated tobacco at Inglewood has been a tenfold increase in the chloride content of the surface soil. It may therefore be necessary to change drastically current irrigation practices in these districts.

Salt damage in grapes has also been located in an orchard at Inglewood. This was caused by use of saline water from a waterhole in the bed of the then non-flowing Dumaresq River.

Arsenic toxicity studies have continued and beans have been shown to be a very sensitive indicator crop. Further observations in the field suggest that the banana plant is affected by the arsenic through intimate contact of the roots with decomposing rock containing the mineral mispickel. Iron sulphate applied to the soil near banana stools gave a temporary improvement.

Investigations on manganese toxicity in beans were completed and an article on this subject has been published in the *Queensland Journal of Agricultural Science*.

Toxic amounts of boron have been recorded from several centres and have been traced to the use of wood shavings and sawdust obtained from timber treated with borax as a wood preservative. In one case water-soluble boron in the soil was 10 ppm in the affected area and only 0.8 ppm in the healthy.

Many cases of micro-nutrient deficiencies were diagnosed during the year from plant specimens, those of boron and molybdenum being the most common, particularly in the Metropolitan and near-Metropolitan vegetable growing areas.

Field Trials.

In co-operation with the Agricultural Branch, field trials to observe the effects of micro-nutrients on tobacco were laid down at Clare, Inglewood and Maryborough. Final results of those from Clare and Inglewood are not yet available, but a marked response to copper was obtained at Maryborough.

Analytical Investigations.

A satisfactory method has now been devised for the routine determination of potassium in dilute acid soil extracts using the flame photometric method, and this will enable a great saving of time on routine potash estimations. Other work in progress includes numerous determinations of micro-nutrients in tobacco leaf and studies on available phosphate and phosphate fixation in soils carrying natural and sown pastures.

Routine Determinations in Soils and Waters.

Analysis of 2,409 soil samples were done for farmers or Departmental officers. Of these, 268 samples were in connection with the Commonwealth Dairy Extension Grant scheme.

Reports were issued concerning the suitability for stock or irrigation of 1,029 water samples analysed.

MISCELLANEOUS.

New insecticides appear on the market with bewildering rapidity. For many there is no quick accurate method of analysis so commercial use of a promising commodity may be delayed until adequate assessment of risks from spray residues is made. The dieldrin group falls into this class.

By a combination of absorption and spectrophotometric techniques, the laboratory is now able to estimate this drug with reasonable accuracy and speed so that the amounts remaining on marketed crops are known.

DIVISION OF ANIMAL INDUSTRY.

VETERINARY SERVICES BRANCH.

Mr. C. R. Mulhearn, Director of Veterinary Services.



Mr. C. R. Mulhearn.

Pastoral conditions were very satisfactory over most of the State and the rainfall was above average for most coastal areas. Serious flooding was recorded in the Rockhampton and southern coastal districts. For the second time during the past three years the Barkly Tableland area in north-western Queensland missed the general monsoonal rains, and drought conditions were experienced. This necessitated the movement of breeding stock away from the area.

There has also been a trend towards decentralisation of stock marketing, and cattle saleyards are being established at several centres in central and northern Queensland for handling both fat and store cattle.

A new venture in the form of a sale of stud and herd bulls at Cloneuray in May 1954 was very successful, and it should be the forerunner of regular sales of this nature in the beef cattle breeding country. Approximately 400 stud and herd bulls were offered for sale and most were disposed of at satisfactory prices.

The movement of fat stock by road transport from distant stations to the railhead was extended during the year. Large consignments of cattle were moved to Dajarra and Mt. Isa from three properties.

The movement of cattle by sea from the Peninsula to Cairns was inaugurated. An adapted L.S.T. type of barge is being used for this work, and the vessel is able to enter small coastal rivers, load direct from yards on the river banks, and then discharge the cattle direct from the barge to holding yards at the Queerah Meatworks.

Negotiations have been completed for the export of fat cattle by sea from Queensland to Manila and other ports in the Philippine Islands. It is anticipated that approximately 2,000 head will be moved; the first consignment, numbering 142, has already been despatched.

STAFF.

There was very little improvement in the general staff position during the year. The position of Assistant Director of Veterinary Services was created and filled, and this appointment proved of great assistance to the senior professional staff, but two Divisional Veterinary Officers and two Assistant Veterinary Officers were lost through transfer, resignation and other causes. Four additional Assistant Veterinary Officers were appointed.

Resignations and retirements further depleted the field inspectional staff, but the position was relieved initially by the appointment of Temporary Stock Inspectors, and towards the end of the year by the appointment of successful candidates from the examination for Stock and Slaughtering Inspectors. However, even after all available successful candidates had been appointed, 12 vacancies still existed in the Stock Inspection Services. The Schedule for the year's examination was amended, and for the first time separate examinations were held for the stock and slaughtering sections.

The staff position was rendered more difficult by the creation of two additional positions for check grading of meat at the Brisbane Abattoir, and the seconding of two officers for special work on contagious pleuro-pneumonia. Officers for the above duties had to be drawn from the existing staff.

PESTS AND DISEASES.

Losses of stock from diseases and parasitic infestations have been below normal. This is largely due to the absence of outbreaks of serious epidemic diseases, but the action of the staff in carrying out extension duties, supervising stock movements, arranging preventive inoculation and promptly bringing outbreaks under control has been a contributing factor. Only three outbreaks of pleuro-pneumonia in travelling cattle were recorded and one of these was in introduced cattle. There was only one outbreak away from the recognised enzootic area.

The most serious losses during the year were due to cattle tick infestation and tick fever, contagious pleuro-pneumonia, tuberculosis, deficiency diseases, sterility and diseases of dairy cattle such as brucellosis and mastitis.

STOCK MOVEMENTS.

Favourable seasonal conditions were experienced in all major cattle breeding areas in 1953 and stock routes were in good condition. As a result, stock movements were above normal during the July-December period and continued late into the year.

The 1954 wet season was also very favourable in the Gulf and Peninsula areas and stock movements will again be above normal. However, the north-western border stations and the Northern Territory experienced a bad pastoral year. This has reduced the turn-off from these areas, and most of the movements will be completed by the end of June. It is anticipated that less than 30 mobs (as against an average of from 50 to 60) will enter Queensland from the Northern Territory during the current season, and this number will include at least 10 mobs of breeding cattle which are being moved as an emergency measure.

This reduced Northern Territory turn-off is due primarily to the unfavourable pastoral conditions and the unsatisfactory state of the stock routes, but also to the reduced number of cattle available following the severe droughts in 1951-52.

The movement of cattle, both fats and stores, in central and southern Queensland has been above average, and meatworks between Rockhampton and the southern border have been working to full capacity. There has been a reduction in the number of fat cattle moved by rail from coastal areas to New South Wales. This has been brought about by market trends in the price of beef, which now does not allow a sufficient margin to warrant the expense involved in cleansing cattle of ticks prior to entering New South Wales, and the establishment of meatworks for the New South Wales market at Beaudesert.

The number of cattle treated at northern export works has also increased, and not only have most of the northern cattle been killed at these works, but a limited number of cattle from southern and south-western Queensland have also been directed to the northern works in preference to those in southern Queensland. This is due in part to the inability of southern works to handle the cattle at peak periods, and to increased export prices for beef.

TABLE 1.
TRANS-BORDER STOCK MOVEMENTS, 1953-54.

	Cattle.	Sheep.	Pigs.
Entered from Northern Territory	72,058	..	..
Entered from New South Wales	27,489	679,976	569
Removed to Northern Territory	5,710	..	..
Removed to New South Wales	284,196	311,479	28,355

Trichomoniasis of cattle was recorded from two additional properties, whilst vibriosis was reported from several dairying districts. The diagnosis of infectious laryngotracheitis of poultry, which was suspected during the previous year, was confirmed, and a programme of control by preventive inoculation commenced. There were slight extensions of the cattle tick infested area in the Injune, Toowoomba and Warwick districts. Control measures for the eradication of ticks from these areas are in operation.

A survey of the incidence of tuberculosis in beef cattle indicated that this disease is more prevalent than was anticipated, and that it may be spread by the distribution of stud and herd breeding cattle. A plan for the control of the disease in beef cattle is receiving consideration.

Contagious Pleuro-pneumonia.

Activities associated with the control of contagious pleuro-pneumonia were extended and were concentrated in the enzootic area, where previously the husbandry methods employed in the cattle industry made control solely by legislative methods very difficult.

The control employed in these areas is now largely based on extension methods. Regular inspections are aimed at encouraging routine preventive inoculation and improved husbandry. The usual control measures based on legislation are of course still practised.

Additional information on the incidence of the disease has been obtained by more regular inspections in the suspected area, together with a special inspection of all cattle slaughtered in the State for human consumption. Any evidence of resolved, chronic or acute lesions of C.P.P. is followed back to the station from which the cattle originated, where suitable control measures are recommended or brought into operation, depending on the finding in the station cattle. Assistance in this work has been obtained from Commonwealth Departments, namely by the recording and reporting of C.P.P. lesions by meat inspectors at export meatworks, and by a grant from the Commonwealth Extension Services Fund for the employment and equipping of extension officers.

Two experienced officers have been specially trained for this work, and they are stationed at strategic centres in the enzootic area. They have been allotted full-time duties associated with the control of the disease and are working in co-operation with the regular field staff. Information on the incidence or suspected incidence of C.P.P., collected from all sources, is made available to the officers, who make regular visits to all properties within the area under their control, and discuss with stock-owners control by improved husbandry methods. Recommendations include more regular inspections of cattle on holdings, provision of paddocks to facilitate handling of cattle, provision of special inoculation crushes for attachment to existing yards, inoculations of weaners and store cattle into fattening or holding paddocks, and inoculation of stock before being travelled. Methods of inoculation are also demonstrated.

The provision of additional staff has permitted a more regular inspection of both station and travelling cattle, but nevertheless the incidence of C.P.P. as recorded by active outbreaks has shown a decrease when compared with previous years. Fourteen outbreaks were recorded throughout the State, but all except one occurred within the recognised enzootic area. Difficulty in effective control has been experienced within these areas, due to the husbandry methods employed, lack of yards for handling and inoculation, labour problems and unsatisfactory seasonal conditions. However, stock-owners are becoming more appreciative of the value of disease control, and the majority have given full co-operation in carrying out inoculation and preventive measures. Where this has been done promptly and thoroughly, outbreaks have subsided quickly. On the larger properties where facilities are poor or non-existent, complete herd inoculation may take up to 12 months, and as a result the outbreaks have been more protracted. On one property quarantine restrictions have been in force for over 18 months and inoculation of the herd has not yet been completed. Active cases were recorded in this herd over a period of more than 12 months, but the losses are stated to be comparatively light.

The value of inoculation, both to prevent and to control outbreaks, is more fully appreciated, and inoculation programmes are accepted as normal station procedure. Such inoculations are being more widely supervised by Departmental officers, and in general they are being more efficiently carried out. This must reduce the number of susceptible animals and active cases when outbreaks do occur, with a diminution of the number of carrier animals moved to fattening properties in central and southern Queensland and the southern States.

Preventive inoculation of all store cattle leaving or passing through enzootic areas and cattle entering Queensland from suspected areas in adjoining States has been rigidly enforced, and it is considered that this action has been responsible for the reduced number of outbreaks in travelling cattle and in the south-eastern portion of the State.

Experimental work on methods of inoculation and eradication of the disease by means of biological test has been commenced.

Tuberculosis.

The policy of undertaking compulsory testing of milk and cream supply herds in designated areas was continued and expanded. Contracts have been accepted by graduate practitioners for all areas gazetted during the year. These new areas comprise the districts of Gatton, Cooroy, Maleny, Esk, Wondai and Monto. In addition, the Caboolture-Landsborough area was increased by the gazetting of cream as well as milk supply herds. The Rockhampton-Gladstone area is now the only major coastal dairying area where the eradication scheme is not being applied to cream supply herds. The milk supply herds in this area are now tested by Departmental officers and a private practitioner under contract. The milk supply to Tully, Innisfail and Cairns is under Departmental test. Approximately 520,000 head are now under regular test, an increase of 120,000.

It is gratifying to report that the percentage of reactors has fallen considerably after completion of the initial tests, and that this decline has continued in a modified form even after the infection has reached very low levels.

The testing figures for 1953-54 are shown in Table 2.

TABLE 2.

TUBERCULIN TESTING OF DAIRY CATTLE, 1953-54.

District.	Number of Herds.	Number of Tests.	Number of Reactors.	Percentage of Reactors.
Southport-South ..	132	10,402	53	0.51
Coomera-Southport ..	198	12,272	89	0.72
Beenleigh	334	12,091	88	0.73
North Brisbane and Petrie	15	767	5	0.65
Moggill-Kenmore ..	26	1,193	3	0.25
Samford	40	2,297	1	0.04
Beaudesert	209	17,525	69	0.39
Beaudesert-Border ..	39	4,223	28	0.66
Dayboro'	24	1,632	3	0.18
Dayboro'-Mt. Mee ..	29	2,800	9	0.32
Woodford	24	2,518	10	0.40
Caboolture	27	2,277	4	0.17
Southern Ipswich ..	305	15,409	72	0.47
Chamber's Flat-Jimboomba	64	3,184	18	0.56
Maroochy Shire ..	308	22,093	669	3.03
North Ipswich ..	257	12,230	65	0.53
Boonah	469	23,046	558	2.42
Maleny-Landsborough	110	7,503	248	3.30
Esk-Kilcoy	66	3,835	36	0.94
Total for Brisbane Area	2,676	157,841	2,028	1.29
Maryborough	1,948	111,549	385	0.34
Atherton-Townsville ..	280	16,997	28	0.17
Rockhampton	215	13,244	111	0.83
Toowoomba-Downs ..	1,715	82,591	321	0.38
Total	4,158	224,381	845	0.38
Grand Total	6,834	382,222	2,873	0.75

Testing by Departmental officers is still continuing outside the gazetted areas and in some beef herds. One hundred and twenty reactors were detected in 800 breeders tested on one property near Tully, and 56 in 1,180 near Mitchell. Very heavy condemnations were experienced on the claypan country near Townsville.

A survey of condemnations amongst cattle slaughtered in North Queensland works is shown in Table 3. It is pointed out that these condemnations represent much fewer than the total number of animals infected, as only those showing sufficient infection to warrant condemnation are recorded.

Arrangements have been made to carry out an intensive survey of condemnations this year in co-operation with the Department of Commerce and Agriculture.

TABLE 3.
CONDEMNATIONS FOR TUBERCULOSIS AT NORTHERN MEATWORKS.

	No. 1.		No. 2.		No. 3.	
	Bullocks.	Cows.	Bullocks.	Cows.	Bullocks.	Cows.
Total No. Treated	39,454	6,244	38,060	5,188	50,377	12,077
No. Condemned	167½	56½	119½	56½	53½	24½
Percentage Condemned	0.42	0.90	0.31	1.08	0.11	0.20

The relative condemnations are much higher in cows than in bullocks, as the former are usually killed at a later age and have been exposed to greater stresses in the way of pregnancy and lactation. The incidence is by no means constant: the great majority of properties have practically no condemnations, while some properties regularly lose a high percentage of all cattle killed. The condemnations in one line of cows were 28%, and in drafts from other properties have reached 10%.

Brucellosis.

Whole-herd testing as a prelude to eradication is not encouraged except in special circumstances, but 3,000 tests were carried out as a diagnostic measure; 14% of positive reactors were obtained. It is clear that in spite of the extension of vaccination, brucellosis is still responsible for a considerable amount of sterility. Strain 19 vaccination is the recommended method of control and more than 30,000 heifers were inoculated during the year. Field results of vaccination were very good.

Sterility.

Sterility sometimes accompanied by abortion received a great deal of attention. In many cases it is not associated with brucellosis. *Vibrio fetus* has been diagnosed from all the major dairying districts, and with the development of a satisfactory diagnostic test will probably be found to be fairly widespread. It does not appear to be of any great importance, except as an individual herd problem. *Trichomonas foetus* was diagnosed north of Brisbane. Many cases of sterility are associated with mineral and nutritional imbalance. No recurrence of the extensive neonatal mortalities experienced last year was recorded.

Leptospirosis.

This disease was again prevalent, due to the general wet conditions prevailing. Streptomycin has proved the most satisfactory drug; it gives good results, especially in limiting the spread of infection. *Leptospira pomona* has been incriminated in a number of cases showing acute febrile mastitis. In other cases showing similar symptoms the response to streptomycin has been good but the causal organism has not yet been isolated. *L. pomona* has been the main organism isolated, but *L. mitis* has been found in cattle and pigs and is the most common organism in the latter. *L. icterohaemorrhagiae* has been detected in dogs.

It has been shown that *L. pomona* causes abortion and litters of low viability in pigs. The role of *L. mitis* in this regard has not been ascertained, but field evidence suggests that it may cause abortions. It is suggested that wild pigs west of Rockhampton may act as a reservoir of infection for cattle.

Tick Fever.

The usual sporadic cases occurred in ticky country and heavy losses again were reported in north-western Queensland, 45 cases occurring in one mob. Outbreaks were reported when clean country became reinfested with ticks. Most losses were caused by outbreaks of babesiosis, but pure infections with *Anaplasma* and *Piroplasma bigeminum* were reported. The majority of

Anaplasma cases were non-fatal. Preventive inoculations were carried out by officers of the Department in cattle moved from clean to ticky areas, and no major breakdowns were reported.

External Parasites.

Cattle Tick Control.—Conditions favourable for cattle tick propagation were encountered in coastal areas during the early summer months of 1953, and this led to an increase in tick populations and the necessity to commence regular dipping earlier than usual. Slight variations in the tick-infested area have occurred. Inspections carried out during the year indicated that the country between Lake Nash and Dajarra, which became infested during 1950, is now free of ticks. Ticks have not been reported in this country since the end of 1952; the area can now be regarded as clean and cattle are being cleared at Lake Nash. This eliminates the necessity for detaining stock, which have travelled over this route and which are destined for clean country, for a final treatment at a centre on the Great Northern Railway.

There has been a slight extension of the tick-infested country in the Injune and Toowoomba districts, and control measures have been brought into operation in these areas. Affected properties have been quarantined and the stock are being regularly treated. There are indications that the ticks have already been eliminated from certain of the isolated areas, but the control measures will be continued in all newly-infested areas until the ticks have been eradicated.

Requests have been received from stock-owners or graziers' organisations in the Helidon, West Haldon and Wandoan districts for tick elimination schemes for specified areas in those districts. One scheme has already been started and is progressing satisfactorily in the Flagstone-Stockyard Creek section of the Helidon district. A dip was renovated and charged by the stock-owners, and additional equipment and staff were made available by the Department for this project. Preliminary action has been taken in the West Haldon and Wandoan districts. The success of these schemes requires intensive Departmental supervision and unstinted co-operation from stock-owners.

Strategic dips numbering approximately 50, which are maintained by the Department in co-operation with stock-owners, continue to give very satisfactory results. Complete control of cattle ticks on cattle moving from infested to clean country was maintained for the seventh successive year. The movements were carried out smoothly and without long hold-ups, and there were no tick outbreaks in clean country resulting from such controlled movements. All dips, with the exception of one which contains BHC, are charged with a DDT preparation.

Inquiries have indicated that arsenic is still used in approximately half the privately owned dips, and although some of the dips are giving satisfactory control, reports are still regularly received that standard arsenical solutions are becoming less effective. Other preparations used by stock-owners for tick control include DDT and BHC, and various concentrations of these preparations used together or in combination with arsenic. DDT in a new form as a dipping mixture, and toxaphene, have recently appeared on the market for use in dipping vats for tick control.

TABLE 4.
STOCK TREATED IN D.D.T. DIPS, 1953-54.

Number of dips charged	..	..	..	49
Cattle dipped	..	..	..	430,059
Horses dipped	..	..	..	4,946

Reports were again received from field officers indicating that in isolated areas BHC is becoming less effective for tick control. This would imply that BHC tolerant ticks are developing, but there have been no confirmed reports of tolerance to DDT.

Buffalo Fly Infestation.—The early and intensive wet season in the country between Rockhampton and Maryborough made conditions favourable for buffalo fly propagation early in the year, with the result that the buffalo fly numbers built up in these areas and the parasites spread by natural means from the Gladstone district to the Bundaberg district. Regular sprayings of all stock, both around the fringe of the infested area and travelling by rail from the infested area to clean country, were continued, and this helped to retard the spread of the parasite. However, it was necessary to move the spraying plant south from Bororen to Bundaberg to keep ahead of the fly.

One isolated infestation was recorded on the southern side of the Burnett River, but it has been eliminated, and now that the peak of the infestation period has past it is confidently anticipated that the fly will be held on the northern side of the Burnett River in 1954-55.

Heavy fly infestation causing economic loss was reported from the Gulf and Peninsula areas, but effective control was maintained where DDT preparations were used. This was demonstrated in a spectacular manner, particularly in the improved temperament, whilst cattle were being moved by sea from the Peninsula to Cairns.

Sheep Lice Infestation.—Reports from field officers indicate that sheep lice infested areas extend from the Hughenden district to the New South Wales border. Infestations in northern and central Queensland are not as extensive or severe as in the southern section of the State. Dipping or spraying for control purposes is practised on most properties in the infested area, and the movement of lice-infested sheep is controlled to prevent spread of the parasite. Border inspections of sheep from adjoining States are also regularly carried out and it was necessary at times to refuse entry into Queensland until sheep had been treated to eliminate the parasite.

Internal Parasites.

Good seasonal conditions have increased worm populations in all areas, calves and sheep being mainly affected. The barber's pole or large stomach worm (*Haemonchus contortus*), caused heavy losses in sheep, particularly weaners and aged sheep, during the summer. Nodule worm and the lung worm (*Dictyocaulus*) were more prevalent than in the previous year. Tapeworms have been reported as causing considerable losses on individual properties. Trichostrongyles are not of great importance in most years under Queensland conditions. Besides recommended drug treatments, better husbandry is advocated for the control of internal parasites.

Several outbreaks of coccidiosis in calves were reported. Treatment with mepacrine and atebrian was satisfactory.

Poisoning.

As usual, a number of cattle were lost from arsenical poisoning, the sources ranging from malicious baits to old drums lying about the property. In one case it is probable that the tracing of poisoning to an old drum of arsenic pentoxide explained sporadic losses over a period of four years. Over-strength spraying fluids were a common source of deaths, there being little margin for error in the small quantities handled. The highest concentration of spraying fluid analysed was 3% arsenious acid.

Cases of BHC and toxaphene poisoning were reported, mainly in calves. In some cases the fluid was over-strength.

Plant Poisoning.

Losses from plant poisoning on the whole were again low, due to the good seasonal conditions, but many cases involving a few animals were reported.

Hypocalcaemia due to ingestion of pigweed was regarded as the cause of death in several mobs of travelling sheep in the south-western districts.

Thirty-five head of sheep died after eating the cotyledon stage of Noogoora burr at Roma. Yellowwood (*Terminalia oblongata*) caused a heavy mortality in sheep returned from Emerald to Cloncurry, and isolated cases were reported from the Rockhampton district.

Other plants responsible for economic loss during the year included rubber vine (*Cryptostegia grandiflora*) around Charters Towers, water bush (*Myoporum acuminatum*), which caused losses of pigs and cattle in the Upper Burnett, and weir vine (*Ipomoea calobra*) which affected sheep, cattle and horses in the Roma area. *Parsonsia eucalyptophylla* was incriminated in one death.

Ellangowan poison bush (*Myoporum deserti*) caused heavy mortalities in a travelling mob of cows and calves on the Langlo stock route. Deaths in horses on the Leichhardt River were attributed to whitewood (*Atalaya hemiglaucæ*) berries.

Mulga fern (*Cheilanthes tenuifolia*) was responsible for 300 deaths in young wethers.

It was indicated in the Rockhampton district that oesophageal disease in horses could be caused by *Crotalaria trifoliastrum*, as well as by *C. aridicola*.

Further investigation into the aetiology of Georgina River disease established that it may be caused by gidgea suckers as well as pods.

Walkabout losses in horses were lower than in many previous years, probably because owners shifted stock from known affected areas. Although evidence incriminating *Crotalaria retusa* has been collected, this plant is not present in all affected areas.

Bracken fern (*Pteridium aquilinum*), poison peach (*Trema aspera*) and lantana (*Lantana camara*) caused sporadic losses in all coastal areas. The incidence of wallum disease was lower than in previous years.

Deficiency Diseases.

Field surveys indicated the occurrence of deficiencies of phosphorus and copper throughout the coastal area. Attention has been given to copper supplementation by oral and intravenous routes. Very low copper values have been obtained in blood and liver samples from cattle depastured on what is regarded as good dairying country. An extension of the use of bonemeal licks has been noted in the north-western areas which suffer from pegleg. Trials with superphosphate in the drinking water indicate that phosphorus deficiency may be controlled in this way on suitable properties.

Miscellaneous Diseases of Cattle.

Footrot was extremely prevalent in all districts during late summer and autumn; good results were obtained in treatment with soluble sulphonamides.

Mastitis due to *Bacillus coli* and *B. aerogenes* was reported. Staphylococcal mastitis is still a problem, none of the therapeutic substances—streptomycin, streptomycin-penicillin, aureomycin and dibromopropamide—being fully satisfactory against it. Because of the success of penicillin therapy, it is very difficult to interest farmers in the strict hygienic methods desirable in mastitis control. Mycotic dermatitis was reported in calves. Serum protein estimations were made and post-mortem examinations carried out in a number of cases of Soley's disease. A very similar disease has been recorded on a neighbouring property.

Salmonellosis in travelling stock again occurred in many centres. In one case, 51 young sheep died of salmonellosis before treatment was commenced. In this case succinyl-sulphathiazole appeared more effective than sulphadimidine.

The incidence of blackleg was again low. Metabolic diseases and calf troubles, predominantly contagious pneumonia, scours and calf diphtheria, were reported from all centres.

Diseases of Horses.

Very few outbreaks of disease in horses other than those discussed under plant poisoning were reported. An outbreak of strangles in station horses after the return of racehorses from a meeting was encountered. Queensland itch has been very prevalent, due to the favourable sandfly season. A chronic disease of unknown aetiology, marked by incontinence of urine with scalding of the hind legs, was reported affecting mares and geldings near Injune. Cases of five years' standing were recorded.

Diseases of Sheep.

Internal parasites of sheep were extremely troublesome, and heavy infestation with the nasal bot was noted.

Melioidosis was diagnosed in sheep at Hughenden and in goats at Cloncurry. A further outbreak was reported in rams shortly after introduction into the State. Owing to the heavy rains early in 1954, fleece rot caused considerable losses. Tetanus outbreaks were fairly common and inoculations with both tetanus antiserum and toxoid were undertaken. Brucellosis in rams was reported from western areas but there were no reports of symptoms of infection in ewes. Periarthritis was observed following BHC dipping.

Diseases of Pigs.

The usual contagious diseases of pigs were reported from all centres. Sterility in pigs is receiving more attention and the number of cases of posterior paralysis brought to notice is increasing, probably because of their greater economic value. Salmonellosis and Glasser's disease are prevalent.

Myoclonia congenitalis ("dancing pig" disease) in a litter of sucking pigs was diagnosed in the Burnett. Several outbreaks of nitrite poisoning occurred. Erysipelas was reported from several districts, and one outbreak was of an acute nature.

Diseases of Poultry.

Infectious laryngo-tracheitis was confirmed in a number of flocks in the Brisbane and Toowoomba divisions, and it is possible that this disease is fairly widespread. Vaccination of selected flocks has been undertaken. The prophylactic results are good but its use in outbreaks is not satisfactory. Other respiratory infections are liable to complicate the position.

Fowl pox is generally prevalent, especially amongst small flocks. The growing practice of indiscriminate sale of day-old chicks by retail stores to people with no knowledge of poultry raising has caused considerable losses.

Botulism in fowls and ducks is prevalent in northern areas. Spirochaetosis was confirmed at Roma. Manganese deficiency in ducks was reported. Black (or blue) comb has become a serious cause of mortality. Leucosis is encountered in all districts and is responsible for considerable losses.

EXTENSION SERVICES.

In addition to the usual extension work carried out in the course of farm visits, field days were held in all districts, usually in conjunction with officers of other Branches of the Department.

Exhibits have been made available to Show Committees, as well as the services of expert personnel to display them. The use of sound projectors and 16 mm. films has been extended and associated with these Show exhibits.

The Branch was represented at an interstate conference on footrot of sheep held at Young in New South Wales. The inclusion of an open discussion session with graziers of the area was a successful innovation.

BREACHES OF ACTS.

The observance of Acts administered by the Veterinary Services Branch is very necessary for the well-being of the stock industries, and generally co-operation is readily forthcoming from stock-owners and others. However, breaches were reported, and when these were considered to be of a serious nature prosecutions were instituted. There were 12 prosecutions under the Stock Acts, five under the Slaughtering Act and one under the Brands Acts; all were successful. The most serious breaches under the Stock Acts involved the travelling of diseased stock without the permission of an Inspector and failure to obey the order of an Inspector to treat diseased stock. Other common breaches include failure to obtain a permit and complete a waybill prior to travelling stock. The most serious breach under the Slaughtering Act was illegal slaughter of stock for human consumption.

MEAT INSPECTION SERVICES.

The current year has been important for the meat inspection services.

"The Slaughtering Act of 1951" was proclaimed and regulations thereunder gazetted. Provision now exists for the registration of butcher shops and meat delivery vehicles, and action was taken to effect such registration. In keeping with advanced trends in the marketing of meat, a number of butcher shops have been constructed as units of modern food halls where prepared cuts of meat are displayed under refrigeration in an attractive form. Materials such as stainless steel tiles and prepared boards which can be readily and efficiently cleansed have been extensively used in the construction of such units.

A number of slaughterhouses have been constructed to comply with the minimum requirements under the new Act, and a small abattoir was completed and commenced operations at Kilcoy. This abattoir, in addition to providing local requirements, supplies carcass meat for centres from Redcliffe to Nambour.

A local abattoir for the Toowoomba district is nearing completion, whilst Local Abattoir Boards at Ipswich and Bundaberg have called tenders for the construction

of abattoirs in those areas. Progress has been made concerning proposed local abattoirs at other centres, including Rockhampton, Mackay and Townsville.

A differential price for various grades of beef and mutton was introduced by the Department of Justice for the Brisbane Metropolitan Area, and supervision of grading at the Brisbane Abattoir was made the responsibility of Departmental officers. Grading of beef and mutton for the local market has been carried out at the abattoir for some years, but with the introduction of the new scheme the specifications for the grading of beef were amended to comply with export standards.

Yearling beef is not regarded favourably for export as it will not maintain its appearance during handling and storage and does not open up in attractive form in the importing countries. However, it is preferred on the local market, and it is considered that a special class for yearling beef would be advantageous to the consuming public and the industry.

There has been an increased kill in bacon factories in both the Brisbane area and country districts, and pig meats are now being exported chiefly in canned forms.

Closer co-operation between meat inspection and field disease-control services was a feature of the year's activities.

TABLE 5.
STOCK SLAUGHTERED FOR LOCAL CONSUMPTION, 1953-54.

	Bullocks.	Cows.	Calves.	Sheep.	Swine.
Bacon factories ..	18,509	37,019	33,116	5,233	256,672
City of Brisbane (Abattoir) ..	170,255	136,569	187,638	547,633	97,786
Larger population centres ..	81,279	72,164	84,868	217,750	35,765
Country centres ..	35,191	33,982	19,459	64,688	11,774
	305,234	279,734	325,081	835,304	401,997

The value of information on the incidence of disease in stock treated at slaughtering establishments is now being more fully appreciated, and it is being systematically used in follow-up work in disease control in the field. Information is being collected at local and export works, where valuable co-operation is forthcoming from Commonwealth officers.

BRANDS.

DETAILS OF REGISTRATIONS, TRANSFERS, &C., FOR YEAR 1953-54

	Number.	Number since Inception of Registration.
Ordinary Three-Piece Horse and Cattle Brands Registered ..	..	92,242
Cancelled Horse and Cattle Brands Registered ..	949	16,058
Horse and Cattle Symbol Brands Registered ..	107	2,877
Horse and Cattle Brands Transferred ..	2,230	83,075
Cattle Earmarks Registered ..	634	36,651
Sheep Brands and Earmarks Registered ..	272	14,482
Sheep Brands and Earmarks Transferred ..	289	9,578
Distinctive Brands Registered ..	4	1,346
Alteration of Address of Brands ..	240	..
Brands Cancelled ..	17	..
Earmarks Cancelled ..	176	..

There has been a considerable increase in the number of transfers of horse and cattle brands, sheep brands and earmarks and registration of sheep brands and earmarks, and a slight decrease in the registrations of horse and cattle brands and cattle earmarks.

Inspections at saleyards and loading points are being maintained, particularly in the Charleville-Quilpie area, and owners have been warned regarding the careless use of brands and earmarks.

The Sheep Brands Directory complete to the end of 1952 was received and copies forwarded to all Inspectors.

The Sheep Directory complete to the end of 1953 is now in the hands of the Printer.

The Horse and Cattle Brands Directory complete to the end of 1952 has been in the hands of the Printer for some time.

ANIMAL HEALTH STATIONS.

Dr. J. Legg, Director of Research.



This report covers the activities of the Animal Health Stations at Yeerongpilly and Oonoonba.

An important development during the year was the extension of activities to include research into animal husbandry problems. This will be centred at the recently purchased property at Rocklea.

Some reorganisation of staff has been necessary. Mr. A. K. Sutherland was appointed Chief Husbandry Officer and Mr. L. G. Newton Chief Veterinary Pathologist. Mr. A. T. Bell has been appointed Officer in Charge at Oonoonba and Mr. P. S. Berriman has been appointed Assistant Bacteriologist *vice* Mr. F. H. Lewis, resigned.

BUILDINGS AND IMPROVEMENTS.

At Yeerongpilly the bacteriologists now have much more suitable accommodation, and new fittings and lighting have been provided in a large room allocated to histological work. Many more alterations are, however, necessary in some of the rooms, and when these have been made more work can be undertaken.

At Rocklea a poultry research unit is already functioning, and a herd of Hereford cattle and 20 sets of identical twin calves have been assembled as a nucleus for experimental work. A detailed soil survey of the property was undertaken by the Division of Plant Industry, and an experiment on mineral metabolism of grazing cattle has been commenced. Up to the present, however, attention has been directed chiefly towards the construction of buildings, yards and those improvements necessary for the implementation of the programme of work planned. A considerable area has been cultivated, mainly for the provision of green feed for the large number of livestock handled at Yeerongpilly. Silos have been repaired and two have been filled with silage.

At Oonoonba most of the buildings were painted during the year.

The number of specimens examined, vaccines supplied, etc., are shown in Tables 1 and 2.

TABLE 1.

SUMMARY OF SPECIMENS EXAMINED.

—	Yeerongpilly.	Oonoonba.	Total.
Number of batches of specimens ..	3,432	559	3,991
Complement fixation tests for contagious bovine pleuropneumonia ..	50	..	50
Brucellosis agglutination tests—			
Bovine	3,907	357	4,264
Porcine	2,284	89	2,373
Dark ground examination of urine—			
Bovine	108	..	108
Porcine	66	..	66
Milk samples, bovine mastitis	1,070	58	1,128
Autopsies—			
Fowls	1,119	86	1,205
Pigs	133	18	151
Sheep	37	8	45
Cattle	49	5	54
Horses	1	3	4
Goats	..	5	5
Dogs and cats ..	2	9	11
Other animals and birds	43	2	45

TABLE 2.

VACCINES SUPPLIED.

—	Yeerongpilly.	Oonoonba.	Total.
Contagious pleuropneumonia (doses)	168,050	224,177	392,227
Infectious labial dermatitis (doses) ..	181,000	..	181,000
<i>Brucella abortus</i> Strain 19 (number of calves inoculated)	14,336	..	14,336
Tick fever blood (doses)	18,030	10,610	28,640

DISEASES AND PARASITES OF CATTLE.

Tick Fever.

Table 3 sets out the number of cattle immunised and "bleeders" sold over the last 10 years.

TABLE 3.

Bleeders Sold and Cattle Immunised.

(YEERONGPILLY.)

Year.	Bleeders Sold.	Stud Cattle Immunised.
1944-45	53	216
1945-46	73	190
1946-47	76	170
1947-48	134	187
1948-49	110	312
1949-50	156	467
1950-51	214	569
1951-52	111	364
1952-53	234	423
1953-54	149	643

The work generally has been satisfactory, though some of the difficulties encountered in previous years with the inoculation of *Babesia argentina* have again obtruded. With this organism the reaction is not always easy to control with the standard drugs used; moreover, some animals appear to be susceptible to these specifics and collapse and die soon after treatment. Occasionally the reaction to tick fever has been complicated by intercurrent disease (e.g., salmonellosis, sometimes seen in cattle after long train journeys), and this increases the hazards of inoculation. At other times it has been noted that animals after undergoing a satisfactory reaction develop a steady and progressive anaemia. This is probably due to the damage done to the haemopoietic tissues, either directly by the tick fever organisms themselves or indirectly by any toxins they may produce, with resultant anaemia and eventually death of the animal.

Tick Control.

This work has been continued but not expanded in any way. The tick remains the most serious disease problem of the cattle industry in this State, and judging by the ability of the parasite to adapt itself to new conditions it looks like remaining so for some time to come.

Some spraying trials (e.g., those with toxaphene and chlordane) have now been in progress for six years. There is no evidence of any resistance by the parasites to these two preparations in the experimental herds, though there was evidence of some resistance to chlordane in one other herd where treatment had to be abandoned for reasons outside the Station's control.

One herd treated with dieldrin has now completed its fourth year of treatment with satisfactory results.

There is some evidence that cattle ticks are becoming resistant to some of the chlorinated hydrocarbons, the only one which appears to be the exception being DDT.

Further evidence has come to light regarding the toxicity of BHC for cattle. In one instance an owner, not being satisfied with the lethal quality of the dipping fluid as measured by the "kill" of ticks, decided to dip his dairy herd a second time after an interval of only three days, with disastrous results. It is becoming obvious that care must be exercised in the use of BHC in tick control, more especially in hot sultry weather and with those formulations in which the BHC is in an emulsion form.

One dipping vat charged for the last seven years with DDT has retained its lethal qualities as indicated by biological test. There has been no indication of breakdown of the DDT.

Infertility.

Infertility is one of the major problems of dairy cattle and calls for more intensive investigation. As a preliminary step, 107 sets of genitalia from cows slaughtered under T.B. regulations were examined. Sixteen were from pregnant cows. Of the 91 non-pregnant specimens, 78 showed no significant pathological changes, 4 a tuberculous metritis, 4 purulent metritis, 4 a low-grade metritis and 1 a purulent vaginitis.

Brucella abortus was isolated from one uterus, *Vibrio fetus* from another, and *Corynebacterium pyogenes* was recovered from one vagina showing a purulent vaginitis.

Brucellosis.—This disease has always been considered the most important of the infertility diseases. The agglutination test is now used chiefly as an aid to diagnosis; infected animals were detected in 200 herds from which samples were submitted. The prevalence of the disease when considered in relation to the comparatively small number of calves inoculated with Strain 19 emphasises the need for intensive campaigning on the value of vaccination.

Trichomoniasis.—The disease has now been diagnosed in six herds in this State.

Six suspected infected bulls from one quarantine area were brought to Yeerongpilly and examined weekly for 10 consecutive weeks. Organisms were recovered from but one bull and then only on three occasions. This emphasises the need for repeated examinations of suspected bulls.

Vibriosis.—Serum and mucus samples from suspected cases have been submitted to agglutination tests by techniques similar to those used in America and New Zealand.

Of 260 sera from cattle in 39 herds, 15 were positive, 9 highly suspicious, 14 suspicious and the remaining 222 negative. Two of 23 mucus samples were positive.

Periodic tests were made on serum from a cow that aborted a foetus infected with *V. fetus*. Seven weeks after abortion it reached its maximum titre; four months later the titre was classed as suspicious, and after two more months it was negative.

Contagious Bovine Pleuro-pneumonia (C.P.P.).

The rapid slide agglutination test for C.P.P. using a stained antigen prepared by the C.S.I.R.O. Animal Health Research Laboratory, Melbourne, was carried out in two infected herds and one with a negative history. Untreated and oxalated blood samples were tested, and the results compared with the complement fixation (C.F.) test on sera collected simultaneously.

Of 56 animals in the uninfected herd, all were negative to the C.F. test, but two reacted to the rapid slide test.

Of 371 animals tested in two infected herds, the rapid test appeared to be less efficient than the C.F. test. It was considered that in its present form the rapid test could not supplant the C.F. test, but more work is required on the problem.

Copper Deficiency.

At the Rocklea Station an experiment was commenced in December 1953 to study the relationships between seasonal fluctuations in botanical and chemical composition of pasture, and the copper, phosphorus and molybdenum status of the animals and their liveweight gains. Hereford cows and calves and five sets of identical twins are being used on a paspalum-white clover pasture. The Biochemical and Agrostology Sections of the Division of Plant Industry are collaborating in the detailed observations that are required.

DISEASES OF SHEEP.

Melioidosis.

Two further outbreaks have been diagnosed at points widely separated. Serological work is proceeding with a view to obtaining a reliable diagnostic test.

Body Strike.

These studies have been continued in association with officers of the C.S.I.R.O. Further trials have been conducted to test the efficiency of DDT, BHC, dieldrin, aldrin and malathion in preventing body strike in sheep. These insecticides have been applied to the back of the sheep, either in the form of a fine spray that wets the tip of the fleece or as a jet that saturates the wool to skin level. The effectiveness of the insecticides has been measured in two ways:—

- (1) Their anti-adult properties (*i.e.*, their ability to prevent flies from ovipositing) by placing artificial attractants in the fleece and exposing the sheep to heavy insectary populations of *Lucilia cuprina*.
- (2) Their larvacidal properties (*i.e.*, their ability to prevent strike developing after implanting first-stage larvae on the skin).

The results of the anti-adult experiments are difficult to interpret, and no accurate comparison can be made between insecticides. In general, it can be said that the anti-adult properties of these insecticides have in the past been over-rated. DDT, even when applied as a 1% emulsion, allowed oviposition when checked five weeks after treatment. All other insecticides at 0.25% active ingredient allowed oviposition within two weeks of treatment. Though oviposition occurred, the fleeces were still toxic to flies, and treated sheep often reduced the insectary population to about half in 24 hours.

The criterion of loss of effectiveness as a larvacide was arbitrarily chosen as 50% of the sheep recording two or more strikes from the larval implantation method.

BHC, dieldrin and aldrin applied as a jet at a concentration of 0.25% active principle gave protection for 18-20 weeks, while the same insecticides applied as a surface spray gave protection only for 8-10 weeks. DDT at 1% strength gave only eight weeks' protection from jetting and less than six weeks' protection after spraying.

A further experiment, where the insecticides were applied as a jet and at three concentrations, gave the following results:—

Insecticide.	Concentration.	Protective Period.
	%	Weeks.
BHC (gamma)	0.25	14
	0.1	13
	0.05	11
Malathion	0.25	10
	0.1	10
	0.05	10
Aldrin	0.25	19
	0.1	15
	0.05	11
Dieldrin	0.25	19
	0.1	16
	0.05	11

These protective periods were obtained under laboratory conditions and cannot be interpreted as applying to field conditions.

Epididymitis in Rams.

An intradermal skin sensitivity test has been developed for diagnosing this disease. Approximately 0.1 ml. of a formalinised suspension of the Brucella-like organisms recently isolated from the lesions is injected into the bare skin behind the elbow. The test is read between the third and fourth days. An easily palpable swelling somewhat smaller than a positive tuberculin test reaction in bovines is regarded as positive.

Preliminary field tests have given promising results.

Copper Deficiency.

A field trial was undertaken in north-western Queensland to compare copper glycinate injection and copper sulphate drench as a preventive for copper deficiency in young sheep grazing a Mitchell grass-Flinders grass pasture. The trial commenced in September 1953 in collaboration with the Biochemical Section and the Sheep and Wool Branch.

Four groups of 90 weaners are being treated as follows: copper sulphate drench once a month ($\frac{3}{4}$ fl. oz. of a 4% solution), copper sulphate drench every 6 months (same dose as for previous group), and copper glycinate injection in doses equivalent to 20 mg. Cu and 30 mg. Cu every 6 months. A fifth group consists of untreated control animals. After 6 months the liver copper concentrations of the untreated sheep had declined to borderline levels; the group drenched once only and the group injected once with 20 mg. Cu had also declined, but their liver levels were still adequate; the group injected once with 30 mg. Cu remained normal, while the group drenched once a month were high. The persistent effect from the single drench in this trial suggests that this simple preventive measure may have more merit than work elsewhere would indicate, and that it is therefore worthy of further study. There has been no significant difference so far in the weight gains of the different groups.

The trial is proceeding and will include fleece examinations when the flock is shorn.

Humpyback.

It was reported last year that field surveys had indicated the native plant *Solanum esuriale* (quena) as the suspected cause of this disease, and that a condition closely resembling humpyback was produced in one of the two experimental sheep that were fed the plant at Yeerongpilly. Although the plant grew abundantly in some western districts after the rain of January 1954, most of it failed to mature. It was therefore difficult to obtain supplies of fruiting plants for feeding tests. However, the fact that during this season there were no reported outbreaks of humpyback would tend to support the present hypothesis that the disease is caused by feeding on this plant when it is in the fruiting stage.

Urinary Calculi.

No serious outbreaks of calculi were recorded, but small losses occurred in a number of flocks. In fact, sporadic deaths from calculi seem to be rather common and to represent in the aggregate an appreciable cause of financial loss.

Experimental work concerned the effect of diet on water intake and urine output. Sheep fed lucerne chaff produced 1,200–2,000 ml. of urine per day, whereas when fed cereal chaffs the volume was only 400–600 ml. Additions to the cereal diet of bonemeal, ground limestone, magnesium salts or protein meals did not markedly increase urine volume, even when the protein level was raised to that of the lucerne diet. The sheep varied their water intake in proportion to their urine output. Since low urine volume might be one of the factors concerned in the formation of "stone", the study is being continued.

DISEASES OF PIGS.

Brucellosis.

That regular agglutination tests and general control measures are effective is indicated by the fact that 12 piggeries have been freed of the disease during the past six years and are now in the list of tested herds.

The number of infected herds under test each year remains fairly constant, although there has been a steady increase in the number of samples submitted.

Leptospirosis.

Although serum agglutination tests had shown that *Leptospira pomona* and to a less extent *L. mitis* infections were common in Queensland pigs, it was generally believed that these infections caused little harm. However, field reports so strongly associated their occurrence with abortion and stillbirths at full term that experiments were set up to determine the position.

Of six sows infected with *L. pomona* during pregnancy all farrowed about two weeks prematurely, but except for one sow which showed fever and inappetance no clinical effects were seen. Sixty-two piglets were produced, of which 54 were born dead and only three survived more than two days. Sixteen of the dead piglets and some foetal membranes were infected with leptospira.

Leptospira were excreted in the sows' urine for 4–83 days.

One sow infected during pregnancy with *L. mitis* ceased excreting leptospira in the urine three days before farrowing, and produced a normal healthy litter of piglets.

Studies on the subsequent breeding performance of previously infected sows, together with attempts at treatment and vaccination, are being undertaken.

Swine Pneumonia.

To obtain information on the bacterial flora of pigs' lungs in relation to respiratory disease a survey was done on pigs slaughtered at a Brisbane bacon factory. Up to 15% of lungs in a daily kill showed evidence of pneumonia. In about 75% of cases both lungs were involved.

One hundred pneumonic lungs were examined. *Pasteurella septica* was isolated from 70—in pure culture in 36 and associated with other bacteria (haemolytic streptococci, coliforms or micrococci) in the remaining 34. Six affected lungs were sterile. The 60 normal lungs examined yielded no *Past. septica*, although haemolytic streptococci, micrococci or coliforms were usually present.

Thus, *Past. septica* is frequently found in pneumonic lungs but not in healthy lungs. The disease is probably initiated by infection with a virus followed by secondary bacteria.

Swine Erysipelas.

An outbreak of the septicaemic form of erysipelas at Crow's Nest was confirmed bacteriologically.

A blood agglutination test using an antigen supplied by the Veterinary Research Institute, Parkville, Victoria, is being investigated to determine whether it is of value for detecting infection with swine erysipelas.

Pox-like Disease.

A disease resembling swine pox but confined to piglets has been investigated. It can be readily transmitted from pig to pig by applying an emulsion of infected tissue to scarified skin and punctured sites. Transmission does not occur by contact. The pig louse (*Haematopinus suis*) is usually regarded as the vector, but the pigs examined were not infested with these parasites, and it is likely that mosquitoes or *Culicoides* sp. were responsible for spread.

After a 5-day incubation period, lesions appear as raised, blanched, circumscribed areas with necrotic centres. The necrotic area spreads, a scab forms and finally heals in three weeks. The condition is usually not serious.

DISEASES OF POULTRY.

Respiratory Diseases.

Infectious laryngotracheitis, a common cause of respiratory disease in other States of Australia, has been diagnosed in Queensland by isolation of the causal virus and cross-immunity and serum-neutralisation tests. The disease seen in this State is the sub-acute form; the peracute disease, characterised by blood-stained discharges and haemorrhagic tracheitis, has not been seen in any of the 15 outbreaks diagnosed during the year. Vaccination using a "wet" chick embryo vaccine prepared at this Station has been used in most of the flocks in which the disease was found. A total of 23,316 birds was vaccinated on 11 farms.

Despite the recognition of I.L.T. as one of the diseases of the "roup" complex in poultry in Queensland, many cases of respiratory disease still occur in which the cause is unknown. A pleuro-pneumonia-like organism has been isolated from a number of such cases examined during the year, but the exact role played by the organism has not been determined. A similar organism has been associated overseas with chronic respiratory disease. Transmission tests are proceeding to determine whether the strains isolated in Queensland will infect fowls.

Effect of Diet on Caecal Coccidiosis.

These experiments were conducted in association with the Poultry Branch to investigate the effects of various chick starter rations on the severity of caecal coccidiosis in young chickens.

Four complete rations, differing in the type and combination of their animal protein fractions, were fed to groups of chickens from day-old. At 3½ weeks of age the chickens were given a heavy dose of *Eimeria tenella* oocysts, and the resulting mortality recorded during the next 10 days. In three separate experiments the mortality associated with rations containing 8% buttermilk powder ranged from 7% to 37%, while meatmeal and meatmeal plus liver meal rations were associated with mortalities ranging from 65% to 95% and 62% to 65% respectively.

Experiments to determine the optimum level of buttermilk powder are in progress.

Survey of Mortality in Laying Fowls.

Mortality among laying fowls is considered to be one of the major factors that contribute to the cost of producing eggs, although few figures are available on the extent and causes of such losses in Australian flocks.

A survey of the losses in three pens containing 1,207 Australorp pullets in a well-managed commercial flock was made from February 1953, when the pullets were put into laying pens, until January 1954, when they were sold for slaughter at about 500 days of age.

During this period 70 birds died, 16 were destroyed and 129 were culled, a total of 215 (17·8%).

During the last 6½ months of this period, recently dead pullets and unmarketable culls were brought to the Station twice weekly for post-mortem examination. The causes of death or culling in the 53 pullets examined were: leucosis 17, tumours 14, peritonitis 11, other diseases 6 and no diagnosis 5. Since many of the tumours would undoubtedly have been found to be manifestations of leucosis, had detailed microscopic examinations been done, it is estimated that about half the losses were attributable to leucosis.

The flock was pullorum-free and suffered no epidemic of infectious disease or feeding upsets during the survey, so the loss recorded (about 18%) is undoubtedly lower than that experienced in most commercial flocks, which is generally considered to range from 20% to 30%.

The findings confirm the importance of adult mortality and of leucosis as major factors that contribute to the cost of producing eggs.

MEAT RESEARCH.

Detection of Horse Meat by Biological Methods.

A highly specific anti-serum for detecting minute quantities of horse meat has been prepared by repeated inoculation of rabbits with a specially prepared horse serum. However, this serum failed with meat that had been heated at a higher temperature than 80°C. for longer than 10 minutes. Further experiments are therefore being done on the production of anti-serum capable of detecting cooked horse meats.

POISONING OF LIVESTOCK.

Chemical Poisoning.

Arsenic.—The dangerous nature of and lack of care in using this drug are reflected in the ever-increasing mortalities, and it must be considered as one of the important causes of economic loss in domestic animals. Arsenic poisoning was diagnosed on 55 occasions in cattle, once in sheep, thrice in pigs and twice in poultry.

Lead.—Five mortalities in cattle, two in pigs and two in fowls.

Phosphorus.—One mortality in fowls.

Fluoride.—Once in pigs.

Nitrite.—Suspected in pigs.

Alpha-naphtha-thio-urea.—Suspected in pigs.

Toxaphene.—Suspected in geese on pastures used by cattle dipped in this substance.

Plant Poisoning.

The following tests, being either a continuation of previous operations or new projects were carried out:—

(1) *Acacia georginae* (*Georgina gidyea*).—This year's operations have shown conclusively that *A. georginae* is the cause of Georgina River disease. Whilst the pods are undoubtedly mainly responsible for the trouble, leaf regrowth in ringbarked country was also shown to be toxic. Field experiments with cattle were set up, in addition to the trials with sheep, and the disease occurred in both species after access to *A. georginae*

bearing pods, whilst control animals remained unaffected. Certain fractions isolated from the seeds by the University of Queensland were toxic for mice, and this approach will be used to determine the toxicity of leaves and also whether *A. georginae* growing in affected localities is uniformly toxic—a very important consideration in relation to the amount of clearing required.

(2) *Macrozamia* sp. (*zamia*).—Previous experiments with *M. paulo-guilielmi* showed that it produced fatal liver damage in animals on reduced food intake. A further trial, in which progressive liver biopsy material was examined histologically and serum samples were checked biochemically, failed to show liver damage.

Two heifers received 116 lb. of *M. paulo-guilielmi* over 121 days and 200 lb. over 80 days without symptoms being produced. A steer similar in size to the smaller heifer (700 lb.) ate 148 lb. of the plant over 100 days and developed well-marked symptoms. The symptoms differed from those produced by *M. spiralis*, being marked by a high accentuated forward stepping. Much more of this species is required than of *M. spiralis* to produce symptoms.

(3) *Xanthorrhoea hastilis* (grass-tree).—An 18-months-old heifer weighing 480 lb. consumed 204 lb. of the flower (spike) in 48 days. The animal remained unaffected.

A smaller heifer received 91 lb. of chaffed flower and stalk over a period of 26 days and showed no ill effects.

Two rabbits consumed 42 gm. ground *Xanthorrhoea* with 200 gm. ground pelleted food per day for 48 days but no abnormality was noted. Lens cataracts were especially looked for.

(4) *Craspedia chrysantha* (yellow top or golden billy button).—In view of field reports from Dalby that this plant causes nervous symptoms and deaths in driven sheep, two 2-tooth merino wethers, weighing 56 and 63 lb., were fed 27 lb. each over 68 days. No effects were produced even when the sheep were driven until fatigued at the end of the experiment.

(5) *Pratia concolor* (milk weed).—An 18-months-old steer weighing 450 lb. consumed 77 lb. of fresh green plant during 16 days. No clinical abnormality was noted.

(6) *Pandanus whitei* (pandanus or screw pine).—Over a period of four days, a steer was fed 15 lb. 14 oz. of chaffed soft part of the fruit, including the core, without producing any ill effects.

(7) *Cryptostegia grandiflora* (rubber vine).—One pound of minced leaves suspended in 1½ gall. of water caused scouring and depression of a 450 lb. bovine. Two pounds given 14 days later caused death in 2 hours. Symptoms included inco-ordination, blanched mucus membranes, laboured breathing and groaning. The plant is extremely toxic for horses. Six ounces caused death in 1½ hours.

(8) *Crotalaria retusa* (wedge-leaf rattle-pod).—Following reports from the Northern Territory that this plant produces the Kimberley horse disease syndrome, a test was undertaken at Oonoonba with plant collected at Ravenswood, N.Q., where a similar type of disease occurs. A total of 52 lb. of heavily seeded *C. retusa* was fed over 34 days. Seven weeks after completion of the test the animal developed inco-ordination, diarrhoea and respiratory distress. At autopsy the liver was found to be severely damaged.

(9) *Crotalaria trifoliastrium* (a rattle pod).—Supplies of this plant obtained at Townsville were fed to a horse for nearly four months in an attempt to produce oesophageal lesions similar to those reported from Rockhampton. This animal showed no obvious abnormality during the period of feeding except that some condition was lost.

Amongst the many other plants that came under suspicion during the year the following are mentioned:—

Pteridium aquilinum (bracken)—in seven herds at Atherton.

Portulaca oleracea (pigweed)—in two mobs of yarded sheep at Offham and Charleville.

Myoporum deserti (Ellangowan poison bush)—in travelling stock at Charleville and Tambo.

Tribulus terrestris (caltrops)—causing oedema of the head in sheep at Charleville.

Terminalia oblongata (yellowwood)—in two flocks of sheep at Clermont.

SHEEP AND WOOL BRANCH.

Mr. G. R. Moule, Director of Sheep Husbandry.



Mr. G. R. Moule.

Fairly favourable seasonal conditions prevailed over the greater part of the sheep pastoral country during the year. As usual, the winter was dry but a large quantity of feed carried over from the previous summer rains. By September, most of the pastures in the far south, the central-west, and the north-west were dry, while the Warwick district was drought stricken. However, the St. George, Goondiwindi, Dirranbandi, Roma, Surat and Dalby districts had fair to good pasture.

Further rain in October brought falls of from 1½ to 4 in. in the southern part of the sheep country. Unfortunately, Warwick recorded only 1½ in., and although this was followed by 2½ in. in November, the resulting plant growth was burnt off by hot dry winds.

Further rains were recorded on the Darling Downs in December, but general rains extended over practically the whole of the sheep country in January and February. Further falls occurred at Dalby, Hughenden and Julia Creek in March, and Blackall, Charleville and Hughenden in April. At the close of the year under review, most of the sheep country was well grassed, although the pastures had dried off quickly in the Roma and Goondiwindi districts.

Most of the sheep were in good condition, although worm infestation was serious in some districts during the autumn. Successful spring and autumn lambings were reported from most districts, and no serious waves of blowfly activity which could not be controlled occurred during the year. As a result, sheep numbers increased and at the close of the year the State's flock totalled 18 millions. The sale of 572,524 bales of wool returned £63½ million to Queensland. Ever since the return to auction selling at the end of the last war, the sheep and wool industries have maintained their position as being the State's most important earner. They still contribute the greater amount to Queensland's overseas earnings.

EXTENSION WORK.

Although it has not been possible to maintain the advisory staff at its full strength during the year, effective extension work has been done. Three advisory officers resigned during the year, one on account of ill-health and another to accept a position at the Queensland Agricultural High School and College. Two graduates in veterinary science, who had completed their academic training under the Commonwealth Sheep and Wool Extension Services Scholarship Plan, joined the staff. At the close of the year there were vacancies for Advisers at Hughenden, Winton and Longreach.

Extension officers contacted 3,649 woolgrowers during the year and conducted 1,151 demonstrations on private properties. Nine field days were held. A dissection of this work is set out diagrammatically in Figs. 1 and 2.

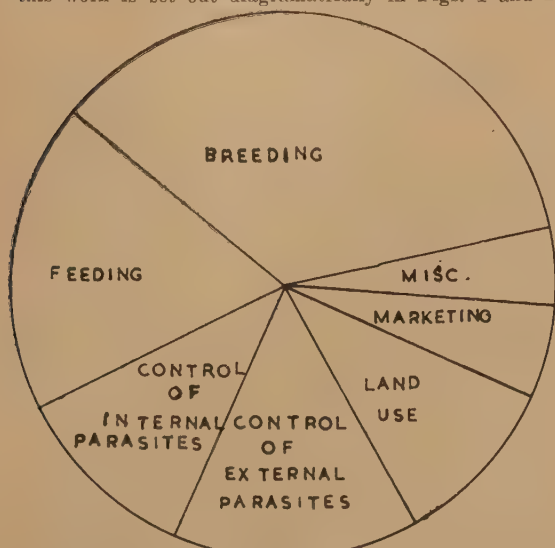


Fig. 1.

DISSECTION OF SUBJECTS ON WHICH ADVICE WAS GIVEN TO WOOLGROWERS IN 1953-54.

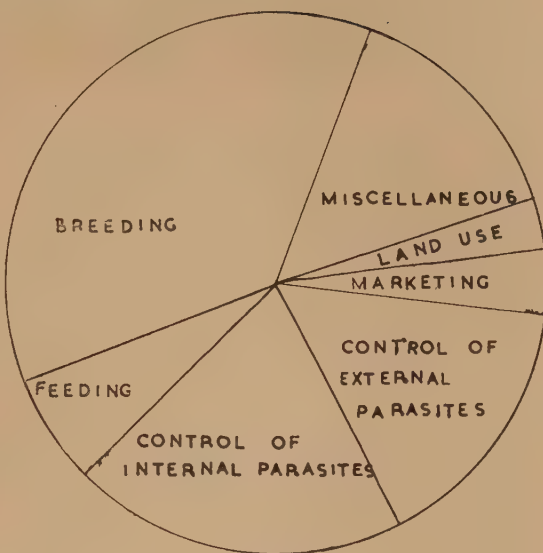


Fig. 2.

DISSECTION OF SUBJECTS OF DEMONSTRATION IN 1953-54.

The field days proved useful to publicise new ideas. They were followed up by field officers who visited the properties of woolgrowers interested in pursuing the suggested methods. The field days concentrated upon fertility and infertility of sheep, and fleece measurement. This latter subject was given wide publicity during the year through the country press. In addition, the Director of Sheep Husbandry attended a conference in Sydney on fleece measurement for flock improvement which was convened by C.S.I.R.O. Queensland was the only State represented at the conference whose Sheep and Wool Branch was experienced in the application of fleece measurement under field conditions.

Besides carrying these two major programmes, field officers were called upon to advise woolgrowers about a wide variety of general subjects. The most noteworthy of these were:—

(a) *Control of Internal Parasites.*—The variable plane of nutrition makes the management of breeding flocks in Queensland difficult. The pastures made rapid growth following the summer rains in 1954. However, they dried off quickly, too, and the plane of nutrition enjoyed by the sheep decreased very rapidly. In these circumstances, infestations of parasitic worms which had been acquired during the late summer became burdensome during the winter. Unfortunately, many woolgrowers failed to anticipate that this could occur and some serious losses resulted. These have to be reckoned in terms of decreased wool weights, retarded growth rates of young sheep and the deaths of lambs as well as of some ewes.

(b) *Control of External Parasites.*—During the spring of 1953 blowflies were quite active in the southern part of the State, but no serious waves of blowfly strike occurred. This was probably due to the greater anticipation displayed by producers in applying protective insecticides and the more widespread use of the Mules operation.

The body louse of sheep has extended further into western Queensland than is usual. This westward movement has been noticeable since the present sequence of favourable seasons commenced in 1950. In view of the serious economic loss caused by lice infestation, woolgrowers have been equipping their properties with facilities for dipping sheep. As many woolgrowers have had no previous experience with the construction and use of dips, the advice of field officers has been sought.

(c) *Land Utilisation.*—Some woolgrowers are giving careful consideration to land utilisation. The productivity of pastoral land depends largely upon the extent to which its natural resources can be developed and husbanded. The present economic circumstances surrounding the sheep and wool industry permit the investment of larger amounts of capital in pastoral properties than was previously thought desirable.

Field officers frequently visit different properties and are in a position to gauge the effectiveness of the various improvements they see. Therefore, they have been of considerable assistance to woolgrowers who are planning more improvements. They have been of particular assistance to new selectors who have acquired holdings from larger properties which have been subdivided.

The attendance by members of the staff of the Australian Estates Company at a school of instruction on various phases of sheep and wool production was a significant development during the year in the Branch's extension programme. The school was of four days' duration and was conducted in Brisbane. It followed an intra-Departmental school on extension methods, and was attended by field officers of the Sheep and Wool Branch. The programme was devoted mainly to considerations of the way wool production could be increased by better breeding and better feeding.

Close co-operation between its extension services and woolgrowers has always been one of the aims of this Branch. The attendance by woolgrowers at schools designed to offer intensive training in some special aspect of sheep and wool production is one of the developments planned in this, as in other Branches.

A field officer was appointed during the year to work amongst sheep raisers in coastal and sub-coastal districts. There seems considerable scope for the inclusion of small flocks of sheep on dairy and mixed farms on the coast. The appointment of this officer and a period of training in New South Wales for both him and the Senior Adviser located at Emerald were financed under the Commonwealth Extension Services Grant.

Making Sheep and Wool Extension More Effective.

Further consideration has been given to ways of making sheep and wool extension more effective. The most important steps taken within the Branch were the holding of a school on extension methods, and the decision by extension officers to concentrate their energies this year on two extension programmes. All field officers of the Sheep and Wool Branch attended the school. Representatives from other Branches and Divisions within the Department, and from the Victorian Department of Agriculture, also attended. The school was designed to ensure active participation by all officers who attended. Each man presented the information about, and led the discussion on, at least one extension technique. Written assignments were corrected and criticised and each man "presented" several films and acted as Chairman of the school sessions for at least one day.

The lectures delivered by the instructors aimed mainly at forming attitudes; at helping officers analyse the methods they had been using in extension, and to discover their respective strengths and weaknesses. They also attempted to introduce new concepts and skills and to help field officers develop a "two-pronged attack" on extension work; firstly to aim at informing the public about the details and create a favourable attitude towards an extension programme, and secondly to ensure its adoption.

The programme of the school included:—

- (1) An outline of the organisation, aims, spirit and philosophy of the Co-operative Extension Service of the United States of America.
- (2) A detailed consideration of extension methods and techniques used in the United States and their application in Queensland.
- (3) A series of lectures on public administration in relation to the extension services.

Since the school, field officers have made far greater use of the agricultural press, the radio and field days in disseminating information likely to interest people in extension programmes. This policy has already borne useful results. People have become interested in and have formed favourable attitudes towards the ideas the field officers have to suggest when they visit properties.

Diffusion of Extension Information.

The extension to woolgrowers of information derived from research financed by public funds is usually considered to be a function of the State Departments of Agriculture. However, few studies seem to have been made of the various phases of agricultural extension work which they undertake.

In the absence of information of this type, a survey was made in late 1953 by the United Graziers' Association of Queensland of some aspects of extension work in pastoral Queensland. By far the greatest number of participants in the survey considered extension's aim should include the education of the producer. It was readily conceded that extension should aim at increasing production. But in a country which is virtually without the forces of population pressure, it was clear that motives which have a strong personal appeal would have to be used to ensure the adoption of any plan or action.

The 284 participants in the survey were asked to name a new idea which had come to their attention recently and which they had incorporated in the management of their properties. The attention of 31% was first drawn to a new idea by a newspaper article; 27% first heard of it through the extension services of the Sheep and Wool Branch; 24% first heard of it through a friend; the remainder first heard of it through other miscellaneous sources. However, 62% went back to the extension service to obtain further information before they incorporated the new idea in the management of their properties; 12% went back to friends for further information; the remainder either sought information from other sources or found they could apply the idea without further assistance.

Participants in the survey were asked to score different extension methods for interest, instructiveness and conviction. They scored result demonstrations by extension officers working on private properties first for interest, and field days second. Visits by extension officers were scored third. Result demonstrations by owners on their properties were fourth, and newspaper articles and result demonstrations on Government Experiment Stations were fifth. Result demonstrations by extension workers on private properties were also scored first for instructiveness and field days were scored second. Visits by extension officers to private properties were placed in third position, and result demonstrations by the owners on their own properties in fourth. The Sheep and Wool extension literature was placed fifth. For conviction, result demonstrations by extension officers working on private properties were placed first; field days and visits by extension officers were equal for second place. Demonstrations by owners on private properties came fourth and demonstrations on Government properties fifth.

A large number of personal visits by extension officers is inevitable in sparsely settled pastoral country. Practically every visit incurs a charge of at least £5 against extension funds. Many cost considerably more. The distances to be travelled, the state of the roads, and the frequent difficulties encountered in "finding the farmer" on a 30,000–40,000 acre property all contribute to the expense.

The effect of an excessive number of visits to properties on the morale of the extension staff constitutes a major problem. The extension worker, like any other normal person, has a right to expect a reasonable amount of home life. It is extremely tiring to be away from home consistently and to repeat frequently the same message and demonstration.

Incorporating Fleece Measurement in Flock Improvement Programmes.

Facilities for fleece measurement were established five years ago. Fleece measurement aims at measuring the physical properties of the fleece, such as percentage yield, staple length, fibre diameter, evenness of diameter, the number of fibres per unit area of wool-growing skin and the crimping of the wool. Because it dissects the fleece into the component parts which contribute to weights of clean scoured wool, it permits accurate selection for any character in which a flock needs to be strengthened.

Fleece measurement can be used by stud master and flock owner alike. The stud master probably places emphasis on future generations; the flock owner is more likely to be concerned about his immediate flock. It may be argued, therefore, that fleece measurement in studs demands far greater attention to the individual character's contribution to clean fleece weight.

The structure of the Australian Merino stud sheep industry may facilitate the ultimate transmission of genetic progress, resulting from fleece measurement in studs, to the individual animals in all the flocks which contribute to Australia's wool production. But this does not necessarily mean that fleece measurement should be used by stud masters exclusively.

At the present time, 38 flocks are using the facilities provided by the fleece measurement laboratory. Twelve of these are using measurement as an adjunct to other methods of selection.

The arrangement of practical programmes for fleece measurement in flock improvement is not without its difficulties. The nature of the obstacles varies and depends upon whether the property is run as a stud or a flock.

For instance, the stud master is conscious of the fact that his clients demand different types of sheep, and a set of scales cannot be sensitive to these differences! The flock master is confronted with the necessity for a larger number of small paddocks than he would otherwise need. He may consider the extra labour required to weigh fleeces is not warranted.

The occurrence of obvious conformation faults within any flock may be great enough to account for most of the available selection. This is quite likely to be so in flocks with low reproduction rates.

Fleece measurement demands the detailed consideration of figures; a task at which sheep men do not necessarily excel! In many flocks, sufficient figures are not available to allow an accurate assessment of the level of culling.

The selection of ewes does not contribute very much to the improvement of future generations. Perhaps somewhere between $\frac{1}{10}$ and $\frac{1}{20}$ of the total improvement that can be wrought in a flock could come from classing ewe flocks. Sheep classers vary in their ability to select by visual appraisal sheep which will cut heavily. Their efficiency may be somewhere between $\frac{1}{4}$ and $\frac{2}{3}$ as good as that which can be obtained by measuring clean fleece weight. It might be argued that the flock owner has to decide if it is worth the extra effort of weighing fleeces to ensure that extra $\frac{1}{4}$ to $\frac{2}{3}$ accuracy in selecting for something that will contribute somewhere between $\frac{1}{10}$ and $\frac{1}{20}$ to the genetic progress of his flock. However, that is not the only thing to be considered.

If the woolgrower sets out to cull 25% from a flock of 1,000 ewes and his classer is 40% efficient at picking the heaviest cutters, he can expect the day's work by the classer to add to his clip the equivalent of about 130 lb. of clean scoured wool.

If he then spends 60 or 70 hours weighing individual fleeces in the shearing shed and sorting out the heaviest cutters, he could expect to gain about another 130 lb. of clean scoured wool. (This assumes a greasy/clean fleece weight correlation of 0.8, a typical Queensland figure.) This weighing, tabulation of weights and selection are jobs which the woolgrower, with perhaps some help from his family, can easily do for himself.

If another 400 man hours are spent in sampling and scouring, only another 65 lb. of clean scoured wool is likely to be added.

A fairly large proportion of these gains should be held for the lifetime of the ewes and the work involved in weighing fleeces is clearly justified.

The main advantage from selecting ewes on fleece weight is to increase the present level of production of that part of the flock which is retained. Selection on fleece weight is so effective in doing this that it could be worthwhile to class the wethers this way, too!

There are 74 Merino studs in Queensland. One has been established for 98 years; some for as few as 6 years. Until recently, no stud has been closed to the introduction of outside blood; all have drawn leading sires from studs in other States, or from one another. Very few have drawn leading sires consistently from one source.

The Merino studs located in Queensland are now supplying about 75% of all the rams purchased by Queensland's woolgrowers. At the present time, more than 90% of all the rams required to mate with the stud ewes in Queensland are supplied by one or other of the Merino studs in this State. This may facilitate the ultimate transmission of improvement through breeding from fleece measurement to the State's flock. Any improvement in the stud sheep will be reflected later in the flock sheep.

Fleece measurement offers tremendous scope to the stud owner. Its adoption by the studs could greatly increase the rate of improvement amongst the State's flocks. On the other hand, if the studs do not continue to make the maximum rate of improvement, flock owners who use fleece measurement will find that they can progress more quickly by closing their flocks to the introduction of rams from studs.

Fodder Conservation for the Queensland Sheep Industry.

Drought conditions are an integral part of the environment used by the sheep pastoral industry. In 1946 an industry organisation suggested that the decrease in the State's flock during the four adverse years of 1943 to 1946 may have cost Queensland £10 million. Subsequent events suggested there was a continuing loss of much greater proportions. Queensland's flock varied between 16 millions and 18 millions between 1946 and 1954. It earned, on an average, £43 million per annum. Had it been maintained at the 1942 peak of 26 million sheep, it would have earned an average of about £66 million per annum.

The mitigation of drought in pastoral Queensland is a difficult problem. In 1952-53 the Department launched a campaign, financed from the Commonwealth Extension Services Grant, to popularise fodder conservation in the pastoral country. However, as the extension services to the sheep pastoral industry are excluded from financial assistance under the C.E.S.G., it was left to the Department to finance work on fodder conservation in the sheep areas. A power mower, a side delivery rake and a pick-up baler were purchased for the Toorak Field Station, which was subjected to such a severe drought in 1952 that no fodder could be conserved until 1953. Work during that year showed that bush hay could be cut and stored at a cost of about £3 per ton. A photograph of one of the stacks appears in the report of the Director of the Division of Animal Industry. At the same time, producers commenced conserving hay. Up to 10,000 bales, equalling about 250 tons, were stored on each of a number of properties. Subsequent work at the Toorak Field Station showed that sheep would eat up to 2 lb. of bush hay a day, but that this was insufficient to meet their nutritional requirements. Other substances such as meatmeal, lime and vitamin A had to be added to make the ration complete. This meant a stack of 250 tons of bush hay would be sufficient to provide the bulk in the ration of 5,000 sheep for a drought of 50 days' duration.

Practically all the sheep pastoral country has an average yearly rainfall of less than 20 in., although wide fluctuations in the yearly totals make the average a comparatively worthless figure. Despite these difficulties, two woolgrowers in north-west Queensland commenced to grow crops in 1953. Encouraged by the surprisingly satisfactory results, 10 other woolgrowers invested during 1954 in the machinery necessary for extensive "dry land farming." They conserved more than 10,000 tons of silage produced from between 2,000 and 2,500 acres. This will provide sufficient fodder to feed 200,000 sheep through a drought of 50 days' duration.

Results of this type stimulate the imagination and cannot help but raise speculation about the future of north-western Queensland. However, caution is necessary in drawing up a balance sheet portraying the agricultural potentialities of the sheep pastoral country. Growing crops require a large amount of water, a quantity of the order of 25 gallons being needed to produce 1 lb. of dry plant material. Therefore, lack of moisture is likely to be the most important factor limiting agricultural developments in the west. Special techniques for the conservation of soil moisture are likely to make useful contributions to overcoming this difficulty. But there are other problems. Grasshopper plagues inflicted severe damage on crops during the summer and autumn of 1954. Yields per acre were not particularly high and the handling of large quantities of forage calls for extensive mechanisation. This means the capital cost for machinery is high—it may amount to £5,000.

On the other hand, any steps that can be taken to overcome the violent fluctuations which occur in the plane of nutrition experienced by sheep in north-western Queensland are worthwhile. If they can be pursued successfully they could facilitate the breeding of sheep, which may, in turn, increase reproduction rates of flocks in north-western Queensland.

RESEARCH WORK.

The sheep pastoral country of semi-arid Queensland has more than its fair share of problems. Much of it is open and shadeless. The total annual rainfall is erratic and frequently limited in its distribution. As a result, there is the usual flush of grass during the early part of each year and insufficient nutrients in the grass during the remaining 8 or 10 months of the year. Closer investigation has revealed that much of the soil is sufficiently alkaline to depress the uptake of copper by the plants. The pastures are also commonly deficient in protein, vitamin A and calcium. Reproduction rates amongst flocks in Queensland are low, those in the tropics and sub-tropics being lower than those in the more temperate parts of the State.

The average cut per head of sheep in Queensland has continued to increase. However, it seems probable that more and better watering facilities and more sub-division fencing have contributed more to the increases in the average cut per head than the work of the stud masters. A good deal of fundamental research has been completed by the C.S.I.R.O. on sheep breeding, but field applications of its findings had to be sought.

All of these circumstances have influenced the programme of research work which has been pursued during the year. This work has been carried on under an extramural grant from the Wool Research Trust Fund, as well as on the Toorak Field Station.

Projects Under the Wool Research Trust Fund.

Investigations Into Low Reproduction Rates.—Investigations completed since 1949 have shown that low reproduction rates may result from a number of causes. The most important of these have been infertility among rams and inability of ewes to bear or to rear lambs.

Infertility Amongst Rams.—A survey, which has been in progress for some time, to determine the incidence of conditions likely to cause permanent infertility amongst rams was completed during the year. Over 20,000 rams were examined; 10.7% were suffering from conditions likely to interfere with their reproductive capacity. The incidence of lowered fertility increased with the age of the rams. Only 2.9% of the 1-year-old rams examined were affected, while 35% of rams 7 years old suffered from impaired fertility.

Epididymitis, probably caused by the Brucella-like organism recovered by officers of the Yeerongpilly Animal Health Station, was the most important single cause of wastage amongst the rams examined.

In field breeding trials, affected rams were mated with ewes. The following is typical of the results obtained.

Fourteen 3 and 4-year-old rams, which had been culled from the ram flock because of abnormalities affecting their reproductive organs, were selected for the trial. Seven were affected with unilateral epididymitis and seven had bilateral epididymitis.

Semen samples were obtained by electrical stimulation from all the rams in October, 1952. They were examined for density, total sperm numbers, motility, longevity and morphology of the spermatozoa. All semen samples were defective in at least one of the characters for which examination was made. The majority were of poor density and most of the sperm they contained were morphologically abnormal. Some of the sperm present in each semen sample were motile, but they were of poor longevity.

A mixture of coloured raddle and grease was placed on the brisket of each ram before he was allowed into a flock of between 1,000 and 2,000 ewes confined in a sheep yard. Ewes were removed from the flock after successful service had been witnessed and their rumps consequently were marked with coloured raddle. Each ram was allowed to serve 10 ewes in October 1952, April 1953, and July 1953. Obviously, the same 140 ewes were not necessarily served on each occasion. By January 1954, two lambs had been born as the result of the 420 observed services.

Lambing Performance of Ewes.—Observations were continued on a property in the Longreach district to determine the repeatability of the performance of ewes in producing and rearing lambs. The ewes had been lambed under surveillance in 1952, when 84% of lambs were marked. Seasonal conditions were not quite so favourable in 1953 and 66% of lambs were marked.

All the ewes were dropped in 1949, and on the basis of their performance in 1952 they were divided into three groups:—

- (1) High production group—51 ewes, all of which had sound udders and reared strong lambs to marking in 1952.
- (2) Low production group—54 ewes, which in 1952 failed to lamb, failed to rear a lamb to marking or reared only a slow-growing lamb.
- (3) Control group—54 ewes selected at random from a flock which had not been observed in the 1952 trial, but otherwise had received exactly the same treatment.

The overall lamb-marking percentages for the high and low production groups for the two years (1952 and 1953), for which observations were made, were—

High production group 88.2%.

Low production group 50.2%.

These represent substantial differences in reproduction rates of the two groups. The high production group reared more lambs to marking age than the low production group in both years, and the differences were large enough to be significant. The high production group was superior to the low production group because—

- (1) More ewes conceived and bore full-term lambs in both years.
- (2) A greater number of twins was born over the 2-year period.
- (3) Lamb losses were lower over the 2-year period.

Failure of Ewes to Conceive.—In the past, comparatively little attention has been paid to female aspects of infertility amongst sheep in Queensland. However, the realisation that the same 7-10% of ewes in some flocks may not conceive each year led to the examination of the vaginas of about 3,000 ewes in different flocks. Approximately 7% had abnormal vaginas, and it seemed probable that these abnormalities were sufficient to preclude conception. The ewes had either a constriction or an obstruction in the vagina which was sufficient to interfere with natural mating. Rams experienced great difficulty in serving affected ewes, and mechanical obstructions of this type could be contributing to infertility amongst ewes and to lowered reproduction rates among flocks in Queensland.

Further observations are being continued to determine the incidence of this condition in other flocks, and to determine the importance of abnormalities in the vagina in relation to lowered lamb-marking percentages.

Assessment of Fleece Quality.—Australian wool growers constantly demonstrate their ability to produce clips of the type required on the world's markets. However, research work carried out by the C.S.I.R.O. has suggested new methods for the selection of sheep, but considerable work has been necessary to determine the easiest and most efficient ways of applying them under field conditions. This work has called for the examination of a large number of wool samples and the detailed statistical analysis of the data which have been obtained. These have included studies of the different methods which can be used to sample fleeces to estimate yields and clean scoured fleece weight. Studies have also been made on the most suitable means of packing wool samples for forwarding to the Wool Laboratory. Although the results from this work are not spectacular they are basic to the field application of accurate fleece measurements to flock improvement.

Results having an important bearing on the field application of fleece measurements have been obtained from studies of the relationship between fleece characters which are easy to measure and those which require more detailed consideration. These have shown that it is possible to forecast clean scoured wool weight reasonably accurately from greasy fleece weight in 8 cases out of 10.

A consideration of staple length in association with greasy fleece weight did not improve the accuracy with which clean scoured fleece weight could be predicted.

Far larger variations occur between trade count, crimps per inch and average fibre diameter. The measurement of average fibre diameter for 1,000 wool samples required about 3,000 man hours, and for this reason its use should be restricted to the selection of top stud rams.

Toxicity of Copper Salts to Sheep.—The practicability of overcoming copper deficiency in sheep by subcutaneous injection or drenching with solutions of copper salts is being investigated in collaboration with officers of the Animal Health Station. Questions arose as to the effect of large doses of copper salts on sheep. Therefore, a trial was conducted in association with the other officers working on this problem to determine their toxicity.

Eleven groups of approximately 10 wether weaners were set up. The sheep in seven of the groups were given subcutaneous injections of copper glycinate solution at dosages ranging from 5 mgm. to 60 mgm. copper. Three more groups were drenched with 3.5% copper sulphate solution at rates of 1, 1½ and 2 oz. respectively. There was also an untreated group for purposes of comparison. All the sheep were weighed at the beginning of the trial and again a week later.

Both copper treatments depressed the liveweight gains of the sheep, but injections of up to 40 mgm. copper and the 1 oz. drench appeared to do no real harm. At the highest levels of both treatments, some deaths occurred. There was also some foetid diarrhoea among the groups receiving 1½ oz. and 2 oz. drenches of copper sulphate.

Toorak Field Station.

The Toorak Field Station was established in 1951 to investigate some of the problems of sheep and wool production in tropical Queensland. Use and develop the resources within the district was the philosophical approach behind the establishment of the field station.

To that end attempts are being made to measure the adaptation of sheep to the tropics and to breed sheep specially suited to that environment. These studies are also being used to investigate the extent to which high productivity in the tropics is transmitted from parent to offspring.

The more fundamental aspects of this work, which was commenced in May, are being done in collaboration with the staff of the Physiology School within the University of Queensland.

The details pertaining to the field are as follows:—

Selection of Sheep to Produce and Reproduce in the Tropics.—Sheep from the Peppin strain were selected on the basis of their lambing performance in September 1953. All the ewes selected had reared a strong healthy lamb to weaning age. Attention was also paid to wool production; on the average, the selected ewes cut 9 oz. of greasy wool more than the rest of the Peppin flock at the July 1953 shearing. No low production group was formed, but the rest of the Peppin flock is being used as a control group against which progress can be measured.

The rams were selected on their breeding performance in 1953 and on their wool production.

The sheep were mated in April 1954, and no differences in conception rates were apparent.

Lambing Observations.—South Australian and Peppin Merinos are being run on the Toorak Field Station with the object of comparing their productivity.

During the spring of 1953, 219 ewes comprising 174 Peppins and 45 South Australians lambed under surveillance. Detailed observations were made on their performance. The remaining ewes were not studied at lambing, but at weaning lambs were mothered and tagged so that parentage records were completed.

Lambing began in mid-September and continued for six weeks. The ewes were in good condition throughout the trial. The following are the more important results:—

- (1) Only 68% of the South Australian ewes which were mated lambed successfully. However, 97% of the Peppin ewes lambed.
- (2) Although only 66 South Australian ewes were mated they produced the same number of twins (9 pairs) as the 179 Peppin ewes.

- (3) The total numbers of lambs born as a percentage of the ewes mated were 82 to the South Australians and 102 to the Peppin ewes.

- (4) Losses between birth and weaning were greater amongst lambs born to the South Australian ewes than amongst lambs born to the Peppin ewes. In all, 48% of the South Australian lambs were lost, while 27% of the Peppin lambs died before marking.

- (5) The average birthweights of the lambs born to the Peppin ewes were 0.4 lb. greater than those of the lambs born to the South Australian ewes. That of the former was 7.7 lb. while that of the latter was 7.3 lb. However, there was no difference in the growth rates of the lambs belonging to the strains.

Hand Feeding Sheep in Drought Time.—As 1953 saw the conservation of considerable quantities of bush hay and silage, field trials were conducted to determine the nutritive value of these fodders and to find the best way to use them in hand-feeding sheep. One trial was conducted at the Toorak Field Station and the other was undertaken on "Inverness," Muttaborra.

Feeding Bush Hay.—The cutting of bush hay on the Toorak Field Station had been purposely delayed until June 1953. The object was to obtain low-grade roughage which could be treated in accordance with the method suggested by Ritter in South Africa. From chemical analysis of the hay it was estimated the sheep would receive the following nutrients each week if they consumed 2 lb. per head per day.

Dry Matter	Digestible Crude Protein	Starch Equivalent
13 lb.	.02 lb.	2.52 lb.

As these figures are well below the accepted maintenance requirements of sheep, 2 oz. of maize and 1 oz. of meatmeal were added to the basal ration of 2 lb. of bush hay. Twelve sheep from each of the Peppin and South Australian strains were fed in separate groups. A control group of comparable sheep was allowed to graze the natural pastures comprising Mitchell grasses (species of *Astrelia*) which were stocked at the rate of 1 sheep to six acres. No effective rain had fallen since February 1953 and the trial was commenced in September 1953. The sheep which were fed were confined in small yards while those which grazed had to walk considerable distances to forage. All groups were weighed weekly, no feed being offered on the evening before weighing.

The sheep fed the bush hay and the supplement maintained body weight reasonably well. The cost of this ration, allowing £3 per ton as the cost of bush hay and full freight and cartage charges on the maize and meatmeal, was £158 per 1,000 sheep per month. The maize was withdrawn from the ration on the 90th day after the trial commenced. Although the sheep lost weight they survived for a further 45 days, when beneficial rains fell. The cost of feeding the bush hay and meatmeal was £90 per 1,000 sheep per month. Had it been necessary to import a complete maintenance ration of hay, maize and meal the cost of maintaining the sheep would have exceeded £400 per 1,000 sheep per month, which would have been prohibitive.

The sheep which were allowed to graze natural pasture maintained their weight better than those which were fed bush hay and a supplement of maize and meatmeal. This result was particularly interesting.

By the end of the trial over nine months had elapsed since beneficial rains had fallen. Therefore, the natural pastures were very dry. In addition, the sheep that grazed them had to walk considerable distances to gather their food. This observation raises questions as to the best way to use natural pastures in north-western Queensland during the dry late summer months of each year.

Feeding Sudan Grass Silage.—A 10-week feeding trial was begun on September 8, 1953, with 105 dry ewes which showed no reluctance to eating the Sudan grass silage conserved at "Inverness" earlier in the year.

The sheep were divided into three groups by random selection. Group 1 received 2 lb. silage per head per day until October 27, when 2 oz. meatmeal per head per day and 1% Calphos were added to the ration.

The sheep consumed all food offered. Group 2 received 3 lb. silage per head per day until October 27, when 1 oz. meatmeal per head per day and 1% Calphos were added to the ration. This group left some of the larger stalks uneaten. Group 3 received 4 lb. silage per head per day throughout the trial. This group left a larger amount of stalks than Group 2, up to 1 lb. per head being left on some days.

The animals were weighed seven times during the trial. The sheep which received 2 lb. silage lost weight fairly rapidly until the meatmeal and Calphos were added to the ration. Thereafter they gained weight, but they were still significantly lighter than the groups receiving 3 lb. and 4 lb. of silage per head per day.

It appeared that feeding 3 lb. of silage per head per day was not warranted; 2 lb. of silage plus a protein supplement seemed to be a suitable level for maintenance for a 10-week period. A ration of 2 lb. of silage plus 1 oz. of meatmeal, in these circumstances, cost about £67 per 1,000 sheep per month.

Insecticides for the Control of Blowfly Strike in Sheep.—A number of insecticides which may be use-

ful for the control of blowfly strikes in sheep have recently become available. Two of the most promising of these, dieldrin and aldrin, were compared with BHC in a trial at the Toorak Field Station which commenced on February 19, 1954.

Four groups, each containing 113 uncrutched weaners born in the spring of 1953, were used. The sheep for each group were selected at random and had not been subjected to the Mules operation. Solutions containing 0.1% of each insecticide were prepared, and about three-quarters of a gallon was jetted into the wool on the back and upon the breech of each sheep in the respective groups. Observations were made upon the number of sheep which were struck by blowflies between February 19 and May 17.

Aldrin and dieldrin both gave complete protection from fly strikes for from three to four weeks after application. Dieldrin gave some protection for 6 weeks, but aldrin did not protect sheep from strike for such a long period. In all, 18 sheep were struck in the group treated with dieldrin, 25 in the group treated with aldrin, 36 in the group treated with BHC, and 44 in the control group.

CATTLE HUSBANDRY BRANCH.

Mr. R. D. Chester, Officer in Charge.



Mr. R. D. Chester.

The year 1953-54 was a good one for the beef and dairy cattle industries. Although certain districts in the State suffered droughts or floods, the affected areas were limited and the overall picture was one of above average production.

The Darling Downs and neighbouring country is the area where drought most adversely affected production. Winter rains in 1953 were insufficient to ensure reliable fodder crops, and although relief rains were experienced in the late summer, these were not heavy enough for summer fodder crops or early winter feed. At the end of June there were practically no beef cattle on crops on the Eastern Downs, whereas normally there would be many hundreds of fattening steers on oats at this time of the year.

In central and southern Queensland, heavy flood rains and cyclones were experienced early in 1954. Severe losses of cattle from drowning were reported from a few individual properties in central Queensland in February, but when considered on an area basis they were not significant. Loss of pasture due to long submersion by floor waters and subsequent unprecedented growth of Noogoora burr on the flood plains will have an important effect on the amount of fodder available in these areas during the winter. On the South Coast, few cattle were lost by flooding, but submersion of pasture land had an extremely detrimental effect on subsequent growth and nutritive value of pastures. The floods in this area were followed by a very heavy invasion of pasture grubs (*Psara* sp.), with the result that dairy farmers entered the winter with little or no roughage reserves.

During the July-December period of 1953, approximately 350,000 head of cattle were slaughtered for export. This is an exceedingly high figure for this period of the year. Slaughtering continued above normal in the January-March 1954 period, when approximately 87,000 cattle were killed for export. Though this was some 23,000 below the 1953 peak it was much higher than any other year since 1948. Production of butter was slightly less than that for 1952-53, chiefly because of the adverse conditions prevailing on the Darling Downs.

GENERAL.

Further expansion took place in the extension programme. Additional advisory staff have been stationed at Atherton, Rockhampton, Gayndah, Gympie, and Pittsworth. It is particularly pleasing to be able to record the fact that expansion of personnel has made it possible to station an officer at Gympie to serve one of the most important dairying districts of the State.

It still proves difficult to attract older, experienced men from the industry to the advisory services, and it has therefore been necessary to continue the policy of recruiting young men and training them within the Department. The type of training is deficient in one respect only, and that is, new officers do not have sufficient opportunity to obtain direct experience in management on private properties. The efficient extension officer must be aware of the practical difficulties of management, both on farm and station; he must know at first hand the mental outlook of the farmer and grazier. It is difficult to teach this knowledge rapidly from within the Department in the absence of a cattle property.

In order to use the existing staff more efficiently a change of emphasis with respect to various methods of extension work is being developed. Following the schools of instruction conducted during the past 18 months, greater importance is now being placed on the use of radio, newspapers and demonstrations on private properties, and rather less importance given to farm visits. It is felt that sudden changes in extension

policy are uncalled for, in that the existing methods have not been materially different from those now proposed, but rather the emphasis might be changed gradually from one type of extension to another. The policy which can be adopted does, too, depend to some extent on the personality and particular capabilities of the officer concerned. A simple blueprint does not fill all cases. In order to change the attitude of field staff where this is thought desirable, a series of discussions of extension methods has been commenced in country centres by Mr. J. G. Young, Husbandry Officer, as he visits each district on other work. It is pleasing to note that officers themselves are not always entirely satisfied with their present extension methods and are most receptive to new suggestions.

The development of a fairly extensive programme of property demonstrations, in both the beef and dairy industries, has been made easier by the availability of funds from the Commonwealth Dairy Extension Grant (C.D.E.G.) and the Commonwealth Extension Services Grant (C.E.S.G.). As much of this type of extension as can be carried out by present staff has already been initiated. Such demonstrations can only prove successful when adequately supervised. In districts of small area where production is of a relatively intensive nature, as opposed to the extensive nature of production in the far northern and north-western pastoral areas, field officers are called upon to answer frequent personal inquiries which require farm-to-farm visits. This latter type of extension is considered to be of considerable importance and must be balanced with demonstration work.

Demonstration work carried out with the aid of funds available from the C.D.E.G. has been increased considerably. Co-operation between officers of the Division of Plant Industry, the Division of Dairying and the Division of Animal Industry has been extended on projects which involve management procedures, particularly in regard to pasture and fodder crop establishment and management.

Approximately 80 separate demonstrations are now conducted, involving the co-operation of all three Divisions. In order to co-ordinate this work, an officer of the Cattle Husbandry Branch was transferred from Emerald to Brisbane and given the responsibility of the overall supervision of the demonstrations which had been planned and agreed upon by officers of all three Divisions. This arrangement has done much to increase the efficiency of the organisation and running of this particular type of demonstration.

FODDER CONSERVATION.

Although the importance of fodder conservation has generally been accepted by both dairy farmer and grazier, the difficulties in handling roughages and the relatively low prices of produce compared with high costs of conservation have hitherto discouraged any substantial quantities of roughages being cured and stored, either as hay or as silage.

Two important factors are operating together to change this state of affairs. Firstly, the stability of the market both for dairy and beef products has lately been such that individuals in both industries are now very much more secure financially than had been the case previously. Secondly, the development of efficient conservation machinery for use in Australia has made it possible to handle large quantities of fodder with little extra labour. The forage harvester and automatic baler make possible conservation on a large scale, though for the small man capital cost makes it essential that such machinery be used on a contract or co-operative basis. More recently, the introduction of the buck-rake, by which large quantities of material can be handled cheaply and in bulk, has brought cheap silage within the reach of almost every dairy farmer in the State.

Because of these developments in the mechanics and economy of fodder conservation, a great deal of special attention has been given to demonstration and extension in this direction. Undoubtedly, the quickest and most fruitful way of increasing both beef and dairy production

lies in conserving a great deal more of the present pasture which at present goes to waste and, in suitable districts, growing agricultural crops such as Sudan grass and sorghum during the summer for silage and hay to be fed back in winter and spring.

BUSH HAY CONSERVATION.

Bush hay which was conserved on two properties in the Central Highlands in the autumn of 1953 by the Departmental hay conservation unit was fed back to cattle in the spring of that year.

Scales were not available to assess the value of this hay, so that only eye appraisal of the cattle could be carried out. In the opinion of the owners of the properties, cattle fed the hay maintained weight, whilst those on the natural pasture lost weight. All cattle ate the hay readily after an initial period.

This year the scope of the hay-making demonstration was expanded considerably, and four properties on the Central Highlands were used as demonstrations. At least 100 tons of pasture hay were made on each of three of these properties and on two of them some grain sorghum hay was also conserved.

Though there was considerable delay in commencing operations due to exceptionally wet conditions during February and early March, much better hay was made than in the previous year.

Costs of conservation this year have been slightly lower, and it is estimated that hay is now being baled for approximately 10d. per 65 lb. bale for fuel and labour. This cost, however, does not include depreciation on machinery. Yields per acre have been very similar to those obtained previously—15.25 cwt. per acre, with an average of about 18-19 cwt.

A scale is now available and is being installed on "Albinia Downs," where it is intended to compare weight gains of weaners fed conserved hay with those held on natural pastures.

INFERTILITY.

The importance of seasonal calving in the dairying industry is more apparent each year as more information becomes available from herd recording activities. It is clear that cows which calve in the early spring have potentially greater production than those which calve in the autumn. Further, there is an increasing trend in the industry to turn from cream to milk production as the demand for milk in the larger cities and towns increases.

In order to survey the important trends and types of infertility in Queensland, a specialist officer was appointed in February 1953 to investigate the position. This officer has visited all dairying districts in the State in order to familiarize himself with husbandry conditions. A comprehensive wall sheet to be kept by co-operating dairymen has been prepared and some 500 of them were distributed during the year. It is hoped that each dairy farmer using this sheet will record a complete breeding history of every animal in his herd through the year. Although the first of these sheets are only now being returned to the Department, observations by officers on farms indicate that sufficient of them are being faithfully filled in to allow a worthwhile survey of the infertility situation to be made.

There have been some important developments in the infertility picture in the State during the year.

Vibriosis has been diagnosed on a number of occasions now from widely separated centres, and although it has been found mostly associated with brucellosis in herds, it is apparent that it is a serious cause of infertility and abortion in this State. On more than one occasion, abortions in Strain 19 inoculated herds have been shown to be due to vibriosis. In herds where the disease has been diagnosed, it frequently happens that metritis is prevalent as a cause of infertility. The metritis frequently follows on cases of early abortion, but in other cases results after apparently normal calvings. Sulphadimidine appears to be reasonably effective as a treatment for metritis.

Trichomoniasis was diagnosed in two districts during the year. One outbreak in the Southport area is apparently traceable to the original point of infection

at Beaudesert, but the second outbreak on the North Coast would appear to be independent of previous outbreaks in this State.

Some information has been obtained to indicate that phosphate deficiency could be an important cause of seasonal infertility in Queensland, but further observation will be necessary before this can be confirmed.

BRIAN PASTURES FIELD STATION.

Considerable progress has been made with the establishment of Brian Pastures. Sufficient fencing has been completed to allow reasonable division of the herd, though at least one more paddock will be required before the three breeding herds as originally planned for mating in the spring, autumn and year-round, respectively, can be grouped.

The stock on the property is as follows:—

Breeders	..	..	..	290
Calves	..	..	..	165
Weaners	..	..	..	104
Bulls	..	..	..	8
Total	..	..	..	567

This is as many cattle as should be carried in the present state of improvements, and it is anticipated that some sales will have to be made in order to make room for natural increase during the coming year. With this in view, some 60 head of cows were culled from the main breeding herd and spayed in April of this year. Unless the season improves considerably it is unlikely that it will be possible to fatten these cows, and it may therefore be necessary to dispose of them as stores.

Regular weighings of all cattle commenced as soon as the scales were installed in March. These weighings take place once each month. On the natural pastures available all cattle put on weight regularly until May 1954, when most animals began to lose weight. Generally, cattle have thrived better on the granite country than on basalt creek flats. Grass growth on the basalt country is prolific and rank, and when this grass reaches maturity it may be difficult for cattle to get at the underlying green feed.

KAIRI REGIONAL EXPERIMENT STATION.

The season at Kairi Regional Experiment Station provided more uniform conditions for the development of satisfactory pastures throughout the main lactation period than were experienced in the previous year. As a result, the average production is estimated to approximate 230 lb., or at least 25 lb. better than last year. This was despite the fact that nine first-calf heifers were included in the milking herd of 34 cows. Identical twins kept for experimental work are not included in this estimate.

The policy of calving as high a proportion of the herd as possible in the spring has continued, and 68% of the herd calved in September and October and 21% in November. In order to obtain best results from this system, it is necessary to feed cows rather heavily during the spring on conserved roughages, chiefly silage with some lucerne hay. Adequate supplies of good maize silage have been available each year, and it is considered that the policy of feeding it liberally to freshly calved cows has produced good returns. Although the herd production has averaged better than 200 lb. butterfat over the last three years, with supplementary feeding of concentrates to the heifers only, it has not been possible as yet to prevent a marked decline in production each season from April to the end of lactation. There is no obvious reason for this phenomenon, and in an endeavour to overcome the problem various methods such as strip grazing and rotational grazing of pastures mown at various periods in late summer are to be tested during the coming season. If possible, it is desired to avoid hand feeding even of homegrown roughages to cows late in their lactation.

The policy of maintaining the herd as far as possible on pasture and homegrown roughage has been continued. No concentrates were fed to mature stock. First-calf heifers received 3 lb. of a mixture of 3 parts

sorghum and 1 part meatmeal per day as an extra allowance over and above the normal herd ration in order to ensure steady growth during lactation.

This year an increase in the milk allowance to calves from 1 lb. milk for each 10 lb. body weight to 1 lb. for each 8 lb. was made, and this resulted in somewhat better growth rates of calves during early life. The calves gained approximately 7.5 lb. per week for the first 24 weeks of life, whereas in the previous year the rate of growth was less than 5.5 lb. per week.

Work with nipple feeders was continued, particularly in regard to the testing of two proprietary types of nipple buckets—one of English and the other of American type. Significantly better growth rates were obtained from calves on the usual bucket type of feeding than those fed by the nipple methods (see Fig. 1). The nipple feeders did, however, prevent calves sucking one another, and in herds where disease is a problem this could be an important factor.

KAIRI CALVES

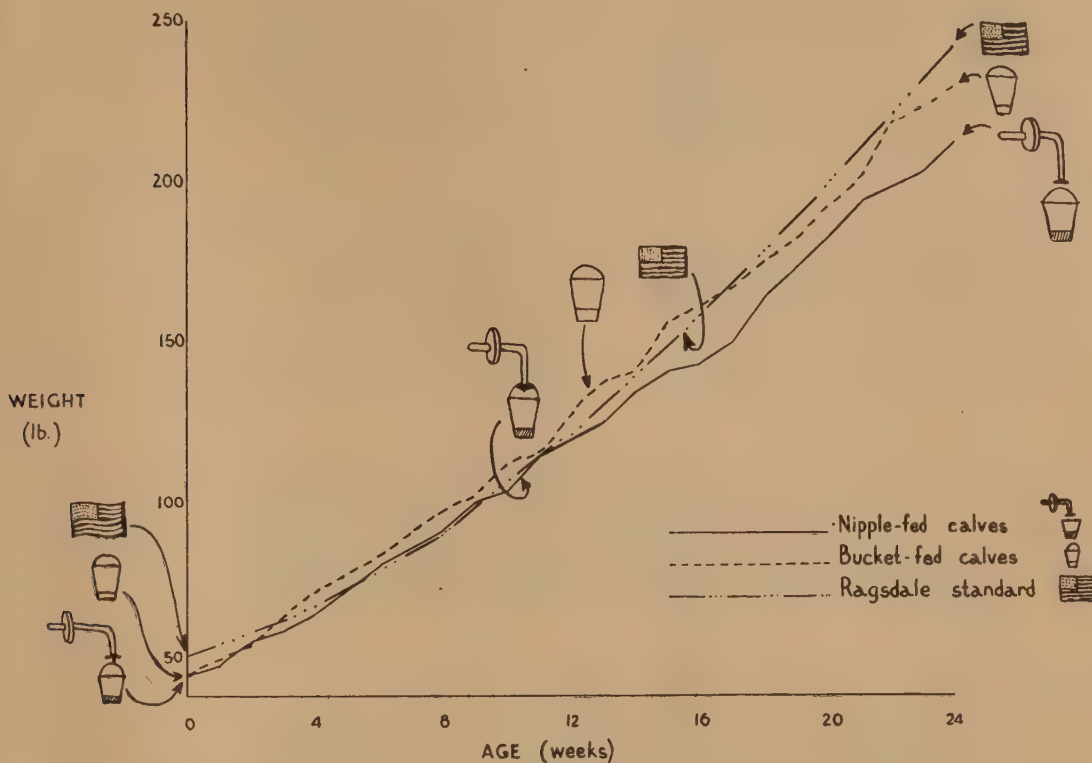


Fig. 1.

GROWTH OF NIPPLE-FED AND BUCKET-FED DAIRY CALVES AT KAIRI REGIONAL EXPERIMENT STATION. THE RAGDALE STANDARD SHOWN IS AN AMERICAN STANDARD FOR DAIRY CALVES.

All cows and heifers were mated to Connemara Stylish Beau, the only bull available on the Station at the time. Since mating, this bull has been sold with the option of re-purchase when its first crop of daughters have completed their first lactation. He has been replaced in the herd by Connemara Sapper, and Boree Efforts Comet has been re-purchased for further use.

In an effort to group the calvings of the herd more closely, artificial insemination was used for the first time this year, and all cows were inseminated over a period of about four weeks. Conception rates were similar to those obtained from natural service. Cows which did return to service were subsequently served naturally.

In the herd this year there were six heifers and cows by Boree Efforts Comet. These averaged 324 lb. butterfat on a mature equivalent basis, and seven heifers by Boree Warrior averaged 250 lb. butterfat on a mature equivalent basis.

PHOSPHORUS AND COPPER DEFICIENCIES.

One of the most important factors limiting production in Queensland is possibly phosphate deficiency. This is widespread throughout the State and is of particular importance in the high-rainfall dairying country of the Central Coast and South Coast and on the lighter soil country of Central and North Queensland where beef cattle are grazed. Copper deficiency is also of some importance in the lowland coastal areas. No other mineral deficiencies have been diagnosed.

A fairly extensive programme of demonstration and diagnostic work in connection with phosphorus deficiency is now in hand. In the dairying areas a considerable amount of blood sampling of cattle has been undertaken, and whilst the deficiency is most evident on the run-down paspalum pastures and semi-wallum country of the coast from Rockhampton south, acute cases of deficiency have been diagnosed in most of the areas. Particularly low blood phosphates have been obtained from cattle on some of the red soil scrub country of the South Burnett which has been cleared and cropped for a considerable period. Low blood phosphates have also been obtained from cattle on the Eastern Downs, where much topsoil has been lost by erosion.

In the beef cattle areas, phosphate deficiency is very prevalent on the lighter soils of the Burnett and Fitzroy Rivers, whilst it is constantly associated with the peg-leg country of the Charters Towers and Norman River districts.

Efforts to demonstrate that improvement can be obtained in the production of dairy cows by feeding bonemeal in a concentrate mixture in the bails have been initiated on two farms in the Moreton District. So far the demonstrations have not been running long enough for results to be available. It is anticipated that a significant difference in production will not be evident until the second and third lactations after feeding begins. Once the phosphate reserves of the animal are depleted, feeding must be prolonged before a return to normal can be effected. In the beef industry it has been

the custom of graziers to supply cattle in the deficient areas with licks containing chiefly bonemeal and salt. Although this type of lick has alleviated the position, and even in some cases given a satisfactory response in growth and calving percentages generally, it has not proved as satisfactory as was originally hoped. In the past year, therefore, field officers of the Branch have made an effort to find a satisfactory method of administering phosphate through drinking water.

Most available soluble phosphates are too expensive for use by this means, but trials with superphosphate have proved promising and these are now being extended. One of the chief difficulties associated with the use of soluble phosphates is to maintain an even concentration of phosphate in the drinking water. Two types of phosphometer have been designed for the purpose—one by Mr. T. W. Murray, Inspector of Stock. Two working models to Mr. Murray's design are now in operation.

There has been considerable interest in copper deficiency during the year, and a much more active programme of diagnostic work has been undertaken. This has resulted in the new areas of deficiency being delineated. It is now apparent that deficiency is likely to occur anywhere on the coast of Queensland and that it will probably be severe on flat flood and tidal plains. Some moderately low blood coppers have also been diagnosed from red soil highland plateaus such as Maleny and Atherton. Insufficient work has been undertaken in the inland beef country for a clear idea of the position to be drawn.

Demonstrations are being carried out on a number of dairying and beef cattle properties in an attempt to find efficient ways of treating the condition.

A long-term project undertaken in the Mooloolah district, involving pasture topdressing experiments with superphosphate, lime and copper sulphate, has shown a favourable response insofar as blood and liver copper levels are concerned, but the improvement obtained in the growth rates of the cattle has been insignificant. The experiment will be continued along the previous lines, but at the same time, some similar aged cattle will be treated with cobalt as well as copper.

Treatment of herd cattle by intravenous injections of copper sulphate has given encouraging responses as judged by improvement in general condition.

On the South Coast, the administration of up to 3 grams of copper sulphate in a small quantity of concentrate has failed to effect an improvement in the production of dairy cows. Blood copper levels of cattle treated in this way have fluctuated from low to normal throughout the year. On the other hand, cattle on similar country receiving 4 oz. of molasses plus 3 grams of copper have shown good responses in appearance and production, and at the same time the blood copper levels have risen from very low to normal.

FEED INTAKE BY DAIRY COWS.

In an effort to emphasise the importance of adequate home-grown roughage as an essential basis for profitable milk production, demonstrations have been carried out in the Brisbane area to show that cattle are incapable of eating sufficient food on certain types of poor pasture commonly available to dairy cattle in Queensland.

The dye technique, referred to in last year's report, has given fairly constant results for the feed intake of several cows in a group when dosing of cattle and handling of faecal samples have been carried out carefully by Departmental officers.

Trials carried out this year in the Samsonvale and Oxley districts further emphasised the fact that cows are in fact only eating sufficient feed to produce 1-1½ gallons of milk. Their estimated dry matter intake capacity is some 5-6 lb. (or 20%-24%) greater than the actual intake.

It has been found that demonstrations of this type can be of great value in extension work in connection with fodder conservation.

GRAZING BEHAVIOUR OBSERVATIONS.

Observations on the grazing habits of British cattle on the tropical coast of North Queensland were continued (see Fig. 2). At the Bureau of Tropical Agriculture, South Johnstone, bi-monthly observations were made on Shorthorn and Hereford steers on improved pastures in the moist high rainfall zone. At Ayr, similar observations were made on Shorthorn steers on irrigated pasture in a zone of lower rainfall.

At the beginning of the observations, no shade was available to the steers at Ayr. During the summer months, steers in these trials, particularly those in tall-growing pastures such as Guinea grass, where air movement was considerably decreased, suffered much discomfort from heat and humidity. There were occasions when the steers were observed to wallow in the mud and slush made by water overflow from a drinking trough, apparently in an effort to reduce body temperature.

Both groups of steers showed a tendency to graze more between sundown and sunrise than during the daylight hours. The percentage of grazing between 6 a.m. and 6 p.m. varied between the two stations and according to the time of the year and the climatic conditions at the time the observations were made. At the Bureau of Tropical Agriculture, 100% of grazing time was between 4 p.m. and 8 a.m. in October. This decreased at each subsequent observation until only 78% of the grazing time was between these hours in June. At Ayr, March was the month during which night grazing was most evident, and in June less than 50% of grazing time was between 4 p.m. and 8 a.m.

These observations have now been extended to the herd of Jersey cows at Kairi Regional Experiment Station at a latitude of about 17°N. but where temperatures are moderate because of an elevation of some 2,350 ft. above sea level. Initial observations here do not give any clear indication of big differences between day and night grazing. Grazing was much more evenly distributed, with three peaks at about 10 a.m., 7 p.m. and midnight. The observations suggest that it may be important for dairy cows to have access to good grazing during the night as well as during the day.

Indications from the trial are that beef cattle maintained on small areas of improved pasture on the tropical coast should be given ready access to shade. This is considered likely to change their grazing behaviour for the better although it may not affect the total time spent grazing. The average grazing time for cattle both at the Bureau of Tropical Agriculture and at Ayr was just over seven hours.

BEEF CATTLE WEIGHING DEMONSTRATIONS.

The importance of pasture improvement, agricultural crops and more intensive management techniques in stepping up beef production in Queensland is becoming increasingly clear to all those associated with the industry. A large number of progressive graziers who have suitable country are seeking assistance from the Department concerning pastoral and agricultural developments. Better and more stable prices for beef have stimulated this new outlook, but if graziers who have had little experience in pasture work or crop production are not to be disappointed in the return received in terms of beef per acre, they will require to develop carefully conceived programmes based on all the available data. Only by so doing will they be able to see just what does happen in the growth and fattening of cattle during their lifetime and to measure and assess the importance of various environmental influences.

In order to obtain information of this nature, cattle weighbridges have been installed at 14 centres in Queensland and steers are to be weighed regularly from weaning to slaughter. These scales are distributed throughout the cattle country in the eastern part of the State, so it is hoped to collect information from several districts and from properties with differing management policies within the districts.

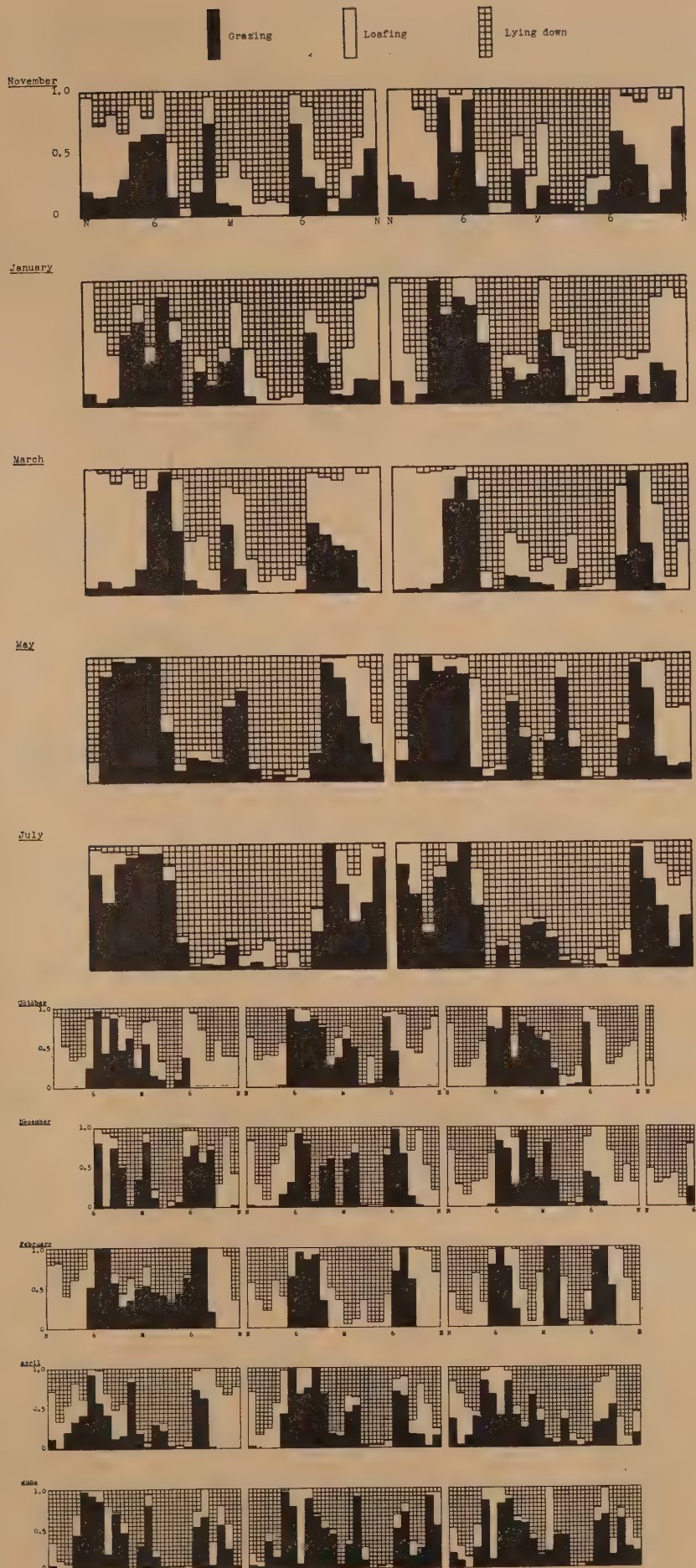


FIG. 2.

DIAGRAMS SHOWING GRAZING BEHAVIOUR OF BEEF CATTLE AT AYR REGIONAL EXPERIMENT STATION (TOP) AND THE BUREAU OF TROPICAL AGRICULTURE, SOUTH JOHNSTONE (BOTTOM).

In North Queensland, these studies are being associated with a comparison of growth rates between Brahman cross and British cattle. In the Mt. Garnet district, weighings have now been undertaken regularly

for a period of 18 months. In this particular demonstration Brahman crossbred animals have grown at a greater rate than British cattle of a similar age (see Fig. 3).

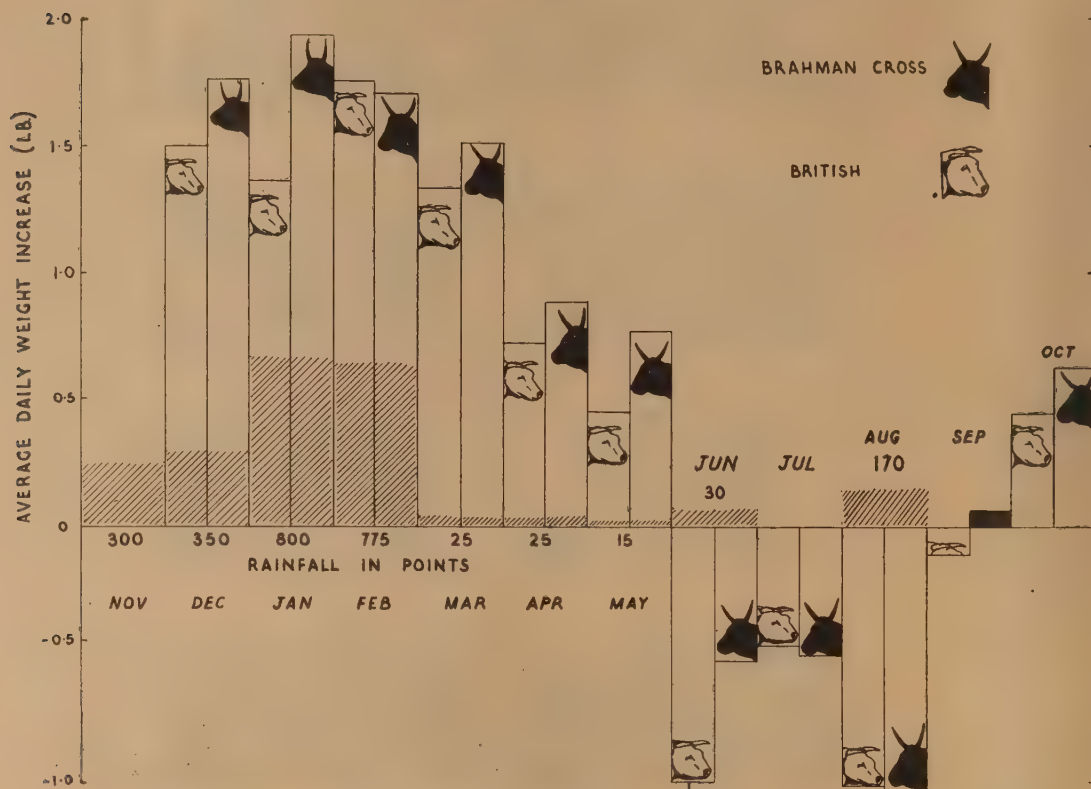


FIG. 3.

DIAGRAM OF WEIGHT GAINS AND LOSSES OF BRITISH AND BRAHMAN CROSS CATTLE IN NORTH QUEENSLAND.

A weighbridge has now been installed on the coast in the Ingham district, where it is hoped to repeat this work under wetter and more humid conditions. The effect of summer temperatures on cattle in this environment will be watched with particular interest.

Other weighbridges will be used to assess the effect of crop feeding and the use of improved pasture mixtures.

CONCENTRATE FEEDING DEMONSTRATIONS.

Concentrate feeding demonstrations conducted with finance available from the C.D.E.G. have been carried out for a period of five years in six different dairying districts of the State. The concentrates used were mixtures of grains, meatmeal and peanut meal varying in crude protein content from 10% to 50%. These demonstrations were based on the results of experiments in America and at Kameruka in New South Wales, where it was shown that the feeding of small amounts of concentrate frequently gave good response in production.

At the conclusion of the demonstrations at the end of June, 1953, assessment of the results was made. This showed that under most conditions in Queensland, some response to concentrates in terms of increased milk production was forthcoming, but that it was only rarely the value of this extra milk was sufficient to offset the cost of the concentrates.

Neither the types of concentrate fed nor the protein percentage of the mixture affected the results obtained. There was some evidence to suggest that best responses to concentrate feeding were obtained on farms where the standard of herd management was high and adequate good roughage was available.

This finding is consistent with recent overseas work with cattle and more recent work with sheep in Australia, where small quantities of high-quality protein-rich concentrates have been found to considerably

enhance the value of poor roughages for these animals. Thus, it may be that where roughage is available to cattle, the feeding of a small amount of concentrate will enhance its value; on the other hand, when roughages are not available or are in very short supply, there may be little or no value in feeding concentrates other than that deriving as a direct result of its own food value.

These demonstrations in their original form were discontinued at the end of last year. They were replaced by a small, more closely controlled demonstration on four farms on the Atherton Tableland, where roughages are usually available in adequate amounts. During the six months that these new demonstrations have been in operation, good responses to concentrates have been obtained on all farms.

BEEF CATTLE STUD ACTIVITIES.

Improvements in the quality of the State's beef herds depends to a large degree on the progress which is made within the stud herds. For that reason, interest has been taken in breed management and nutrition of a number of studs. Where possible, detailed information has been collected on methods of show preparation and advice has been given on feeding methods. Where scales are available, growth rates of stud bulls have been obtained.

At the Royal National Association's 1953 Show in Brisbane, a series of measurements were taken on all available stud animals and an attempt was made to correlate these measurements with show-ring placings. It was shown that in almost all cases cattle placed high in their class by the judge were larger in girth measurements and length than those not so well placed.

Some breed differences were apparent. Horned cattle were larger, better in the buttock and had a greater cannon bone circumference than polled breeds. In almost all classes, Herefords were heavier at the same age than other breeds.

EARLY FATTENING OF NORTHERN STEERS.

It is frequently difficult for cattle fatteners to obtain an adequate supply of store cattle for fattening at times when these are required; on the other hand, breeders in the far north of the State experience some difficulty in marketing cattle which are not ready for slaughter. There is also a rather firmly held opinion in the industry that young cattle cannot successfully be moved from northern breeding grounds because of the adverse travelling conditions.

In order to demonstrate what can be done by moving cattle of the breeding country onto coastal fattening pastures, it has been decided to purchase young cattle for Departmental Experiment Stations this year. A total of 94 head of 18-months old steers has been bought in the Normanton district, walked to Julia Creek and

then railed to the Bureau of Tropical Agriculture (South Johnstone) and Ayr Regional Experiment Station. It is hoped to be able to market there steers as good trade beef at less than three years of age. If this can be done, at least two years will be saved in the fattening time.

SEA TRANSPORT OF PENINSULA CATTLE.

Stock owners on cattle properties in the eastern part of Cape York Peninsula find it difficult to market cattle because of the bad condition of the available stock route to the south. This year, interest has been aroused in the possibilities of movement of cattle by sea. A landing barge has been used to transport some hundreds of cattle to a Cairns meatworks from Cooktown and points further north.

PIG BRANCH.

Mr. F. Bostock, Officer in Charge.



Mr. F. Bostock.

A vacancy caused by the resignation of an Adviser was filled by a promotion within the Branch and a consequential vacancy by the recruitment of a new staff member.

The Branch is still without an Assistant Husbandry Officer.

The following gives an indication of the work carried out by officers of the Pig Branch during the year:—

Office interviews	626
Farm visits	3,167
Pig sales attended	100
Meetings attended	36
Field days	12
Bacon factories visited	84
Shows attended	25
Demonstrations given	40
Lectures given	18
Regional Experiment Station visits	113

PRODUCTION.

Figures available to date indicate that slaughterings for 1953-54 will show an increase on those for 1952-53. This is attributed mainly to the reduced price of cereal grains (especially during the latter part of the year) and the availability of protein supplements. Shortage of cement and roofing iron are, however, still factors militating against increased production.

The quality of the pigs forwarded to market is reported to be very fair, but the overfat pig is still one of the major problems confronting the industry. This state of affairs seems likely to continue under present marketing conditions, whereby, except for the area controlled by the Northern Pig Marketing Board, farmers receive the same return, weight for weight, for an overfat pig as for one with the most desirable proportion of fat to lean. There appears to be a strong move by bacon factory interests to inaugurate a system of differential payments according to grade to provide an incentive to producers to market pigs before they become overfat. The matter of framing suitable grade standards is to be given consideration by this Branch in co-operation with the Australian Pig Society and bacon curing interests at an early date. The Society plans to distribute a leaflet on overfat pigs to all producers in the industry.

The contract price for pig meats for export to the United Kingdom to remain in force to September 30, 1954, is 22.48d. per lb. for first quality baconer pigs, head on carcasses, and or sides. The price is below the present local price of 2s. 2d. per lb., but if grain prices continue to fall should provide a reasonable margin of profit.

Under the present contract, second quality middles, legs, shoulders and bellies have been eliminated. This is causing grave concern to exporting factories, and is no doubt one of the reasons for the present interest in grading of pig meats.

Top weight for first quality has been kept at 160 lb. and the drop in price is 1s. per lb. for 161-170 lb. carcass weight maintained, to encourage farmers to market pigs before they become overfat. In addition, the home market trend is for light-weight carcasses yielding small cuts.

Overseas markets are not particularly favourable. The home consumption of pig meats and pig meat products is the most remunerative avenue open to the industry and should be encouraged.

STUD PIG SALES.

Reports received from field officers of the Branch have indicated a very strong demand for breeding stock and that store sales have remained firm throughout the year.

Commercial breeders are realising more and more the advantages of using purebred stock, and as a result there is keen competition for good blood lines in order to improve farmers' herds.

The Royal National Association and country show societies, by including classes in their schedules for purebred stock from brucellosis tested herds, provide an opportunity for farmers to purchase fresh breeding stock and enable breeders to compare their pigs. The services of Pig Branch officers for selecting breeding stock are sought, not only at shows but also on breeders' properties, and are much appreciated.

The selection of breeding stock on conformation or general appearance alone is by no means a guarantee that such animals will produce stock suitable for present-day market requirements. In this respect the establishment of a Test Station at Rocklea would do much to improve the standard of the State's breeding pigs. Results secured as a result of Test Station work would make available to breeders information relating to utility factors, such as the commercially important features of weight for age at slaughter, food conversion efficiency and carcass quality.

CARCASS COMPETITIONS.

For the seventh successive year the Australian Meat Board in association with the Department and with the co-operation of all sections of the industry conducted baconer carcass competitions on a district basis. Judging was carried out and field days arranged at Mareeba, Rockhampton, Toowoomba, and Brisbane.

The State championship was awarded to a pig, by a Berkshire sire out of a Berkshire X Large White dam, bred on the Northern Tablelands. The carcass of 145 lb. dressed weight secured the record score of 92 points; it was nicely developed and scored very well in all points, though five points were lost in the section related to body length, the carcass being 1 inch less than the standard set by Hammond for a carcass of this weight.

Entries were slightly lower in number than in the previous year, and the general quality of the competition, as a whole, was not as good, though an improvement was noted in the carcasses judged at Mareeba and Brisbane.

A feature of this year's competitions was the increased number of farmers attending the field days arranged in conjunction with the judging. At Mareeba the attendance was approximately 100, at Rockhampton 175, at Toowoomba 250, and at Brisbane 45. Talks and demonstrations of particular interest to pig producers were given and an opportunity to inspect and discuss the carcasses judged was provided. These field days could not have been as successful as they were without the very fine facilities and hospitality provided by the Mareeba, Willowburn, Murarrie and Doboy bacon factories, Lakes Creek meatworks, and Hamilton Cold Stores.

Cured baconer carcass competitions were again popular with country show societies and are providing a very useful means of demonstrating to producers the type of carcass required by the trade. Entries were reported to have increased, and the number of show societies making provision for this type of competition in their Schedules was greater. It would appear that the cured sides exhibited, together with the score card, create a keen farmer interest in these competitions.

GENERAL.

Early in the year a Bacon and Ham Conference convened by the Commonwealth Scientific and Industrial Research Organization, at the request of the Australian Committee on Animal Production, was held

in Melbourne. Several papers were read and speakers stressed the need for better control of curing, it being pointed out that in the majority of cases processing was largely rule-of-thumb and not always satisfactory. This was considered to leave great scope for applying results of research in order to produce bacon and ham of a more uniform quality. It was agreed that a sub-committee be appointed to further investigate matters discussed and to report back to the conference at a date to be arranged.

At Hermitage Regional Experiment Station the piggery buildings, yards, etc., have been completed and two Berkshire sows selected. These sows are to be mated at an early date and when in pig will be delivered to the Station. A third sow and a suitable boar are to be purchased to form the nucleus of a Berkshire stud.

The stud herd of Tamworth pigs at Kairi Regional Experiment Station has been maintained. An improvement in the quality of the pigs marketed at bacon weight has been noted, due to the boar purchased last year. Lone Pine Grenadier is to be disposed of and a new boar purchased. During the year a young Large White boar was purchased in order to mate with young sows; the progeny of this boar are to be used for feeding tests, etc.

A milk pump has been installed at the dairy and a milk pipe line laid. Internal and external shutters were built and fitted to the farrowing pens to provide added shelter and warmth during wet and cold periods. In addition, the staff assisted in the erection of a large water tank stand and have since laid a concrete floor and walled the stand up to make a greatly needed rodent-proof feed shed.

An experimental or lightly constructed trial model of a circular farrowing pen was built. Farrowings in this pen to date indicate that it is likely to prove superior to the conventional farrowing pen for the first 4 or 5 days of the young pigs' life. Such pens may be a means of considerably reducing the State's annual loss of pigs during the period from birth to weaning; at present this approximates 20% of all pigs born.

A deep litter trial was carried out with promising results and at present is being repeated. It is hoped that this system of pig production will be of assistance to producers in the heavy rainfall areas of the district.

Good peanut hay was used in feeding trials as a replacement for lucerne hay in the ration. With both hays fed in the form of a meal added to the rations, pigs on the peanut hay meal made comparable gains to the lucerne meal group. The peanut hay reduced the cost of the ration fed.

There were some interesting results from pasture-fed trials at the Station. Overfat pigs, after 2-4 weeks on kikuyu and green panic pasture as the sole item of food, were graded first quality on slaughter. Pigs approaching baconer weights were also placed on these pastures and fed from 1-2 lb. per head daily of a complete ration, the amount being decreased as their weight increased. Good average gains were made, with carcase quality grading first. It is intended to continue this line of work to determine how much grain may be replaced satisfactorily by pastures which will grow well in the area.

Brucellosis testing of stud herds has been continued and carried out in conjunction with the Veterinary Services Branch; 92 herds have been issued with appropriate certificates and placed on the list published in the *Queensland Agricultural Journal* each month. A further 11 herds have entered the scheme but have still to complete the necessary tests.

Work in the Moreton area in connection with the Commonwealth Extension Services Grant has been continued and during the early part of the year grazing demonstrations on four selected properties commenced. On each of these properties a number of paddocks have been fenced and improved pastures and grazing crops are being established. Portable shelter sheds and various types of portable self-feeders are in course of construction and automatic watering systems will be installed when materials are available. In addition, fixed self-grading feeding floors and self-feeders are being built. On completion of the work at present being carried out on these properties, material will be available for demonstrating to farmers the respective value of both fixed and portable equipment to be used with grazing.

A trial designed to demonstrate the value of supplementing garbage feed with meal in the feeding of in-pig,

suckling sows and young stock is progressing satisfactorily and will demonstrate to farmers in the Brisbane area the value of this method of feeding.

The deep litter system of pig keeping is being demonstrated on several properties in the Brisbane area and has aroused considerable interest among farmers. It is thought that this type of pig keeping will enable small-crop growers and producers operating small holdings to engage successfully in pig production.

Efforts are being made to select, in the southern part of the district, a suitable farmer willing to co-operate in the scheme.

The health of stock has been generally satisfactory but leptospirosis has been reported on several properties in the Moreton, Warwick and Downs areas; investigations into this disease, commenced last year in conjunction with the Animal Health Station, Yeerongpilly, are continuing. Salmonella infection and Glasser's disease continue to be responsible for moderate losses on many properties.

DISTRICT NOTES.

North Queensland Area.

Climatic conditions in this area were unusual; there has been nothing similar since 1921. The similarity to 1921 lies in the fact that rainfall in January and March was only half the average, that in February above average and that in April unusually high; most of the rain came from storms and not from typical wet season conditions. This resulted in dry spells followed by flooding.

As a result of the comparatively dry spring and light rains in January and March, the demand for milk for human consumption reduced the quantity of dairy by-products available for pig feeding. The continued interruption of rail traffic by floods prevented the introduction of replacement feeds such as meatmeal, while grain and mill offals were in short supply and somewhat expensive.

Slaughtering for the year, however, will be approximately the same as last year, and with prospects of a good season ahead for the next few months it is anticipated they will not show the usual marked decrease in the coming spring.

The quality of the pigs has shown further improvement on the previous high standard, the percentage of first grade pigs being approximately 90% for the whole year. There is no doubt that payment on a weight and grade basis, with a marked difference between first and second grade prices, coupled with considerable Departmental extension work, have in a few years largely eliminated the overfat pig in the area.

Though anticipation of future production is difficult, the recent demand for breeding stock and general interest in pig raising would indicate that increased production is likely during next year.

Central Queensland.

Weather conditions during the winter and early spring months of 1953 were far from favourable, with very little rain falling. From October onwards, however, rainfall was reasonably reliable, but in February most of the Central Queensland area experienced flood conditions, which dislocated transport, necessitating the holding of pigs on farms; consequently the factories have treated many baconers which were overconditioned.

Feed supplies in the latter part of 1953 were limited, due to the failure of wheat crops, but good crops of sorghum harvested during the following summer considerably relieved the situation. Each year, more grain is being stored on farms and more fodder crops grown to be used for pig feeding purposes, as producers realise their value in the successful production of good baconers.

The number of pigs slaughtered at factories is greater than last year.

Interest in pig production has extended to grain growers, among whom an increased number have commenced pig raising.

Burnett Area.

Seasonal conditions experienced were nearly opposite to those during the previous year in that the late spring and summer months of 1953-54 were good and the prospects for the winter poor.

Milk by-products available for pig feeding were in about the same supply as last year. In the Gympie district, however, a milk factory is drawing increased

quantities of wholemilk from farmers, while at the Nanango butter factory, all buttermilk is now converted into dried buttermilk powder. These developments will no doubt in the future reduce the quantity of milk by-products available for pig feeding in these areas.

Grain supplies have been good, as favourable conditions early in 1953-54 enabled most farmers to conserve stock from late crops planted the previous summer.

Production throughout the area has increased slightly, and owing to large stocks of grain and the keen demand for breeding stock as well as store pigs, a possible expansion of the industry in the area is indicated.

Darling Downs Area.

Seasonal conditions in this area were very unsatisfactory, the heavy prolonged rain which broke the drought causing considerable damage in many districts. Rain was nevertheless again badly needed by the end of May to ensure even a fair winter. At the end of the month no real relief had been obtained.

Nevertheless production has definitely increased and a further increase appears likely, as many grain growers are looking to pig production to solve the problem of disposing of their crops.

Enquiries are continually being received from persons desiring to specialize in pig production and from others with mixed farms who wish to increase their herds considerably. Projects of the latter nature are doing well, and if the price of grain and the price of pigs remain at their present level, increased activity is anticipated.

Warwick Area.

Losses of baby pigs, poor growth and lactation failure have been experienced. Positive evidence of leptospirosis has been detected on several properties and as a result disease investigation, in co-operation with the Animal Health Station and Veterinary Services Branch, has been carried out and will be continued in an effort to reduce this economic loss and assist producers within the area.

Moreton Area.

Pig raisers experienced a favourable year for production. Seasonal conditions were better than last year, with less heavy frosting and fewer heatwaves than usual. The Brisbane Valley area was, however, an exception, extremes of cold and heat occurring during the year.

Due to the improved grain supply, pig raisers generally are expanding their herds whilst new projects are increasing at a steady rate. It is interesting to note the number of grain growers that are commencing pig raising.

Sucker mortality is being reduced considerably by careful selection of breeding stock and the elimination of artificial aids to farrowing. Herds in which selection for mothering ability is practised have dispensed with sloping farrowing floors, farrowing crates and similar contrivances. They are now breeding sows which are averaging 9.6 pigs reared per litter.

More garbage feeders have installed steam boilers for efficient cooking of food. The hygiene is slowly improving in most cases.

POULTRY BRANCH.

Mr. P. Rumball, Officer in Charge.



Mr. P. Rumball.

For the first time for some years an increase in egg production may be reported. This increase is evident throughout the State but is more pronounced in South Queensland, the intake of eggs by the South Queensland Egg Marketing Board being 8% higher than in the previous year.

In the spring, Queensland in common with other States has a surplus of eggs above local needs. During the post-war years, the surplus was disposed of at an assured price to the British Ministry of Food as eggs-in-shell and egg-pulp. This contract terminated on 31st May, 1953, but an agreement was entered into for the purchase of egg-pulp until 31st May, 1954. Eggs-in-shell during the 1953-54 export season had to be sold on the open market in competition with eggs from other countries. The prices realised were most unsatisfactory to Queensland producers. With decontrol of eggs in the United Kingdom, higher prices had been anticipated. However, there were greater imports of eggs, particularly from the Continent, and production was well sustained due to mild seasonal conditions. It is not expected that the values during the coming export season will be as weak as those of the preceding one; on the other hand, it is not expected that eggs will realise the values obtained previously under contract conditions.

Most commercial poultry farmers expect a fall in values due to a weakening of the overseas market and are giving greater thought than ever to ways and means of reducing production costs. Some are increasing the size of their flocks, others are preparing mash themselves, and a very large number are making greater use of sorghum, a grain which previously they had been averse to using. It is expected that these measures or a combination of them will enable our commercial farmers to meet the position.

EXTENSION WORK.

Officers of the Poultry Branch are located at Atherton, Townsville, Rockhampton, Bundaberg, Caboolture, Ipswich, Toowoomba and Brisbane, thus bringing all major poultry-producing districts into intimate contact with Departmental advisory services.

During the period under review officers of the Branch made over 4,500 visits to poultry keepers throughout Queensland and conducted 524 demonstrations on farms. A dissection of the advice given by field officers is shown in Figure 1 and the following comments are offered in relation thereto.

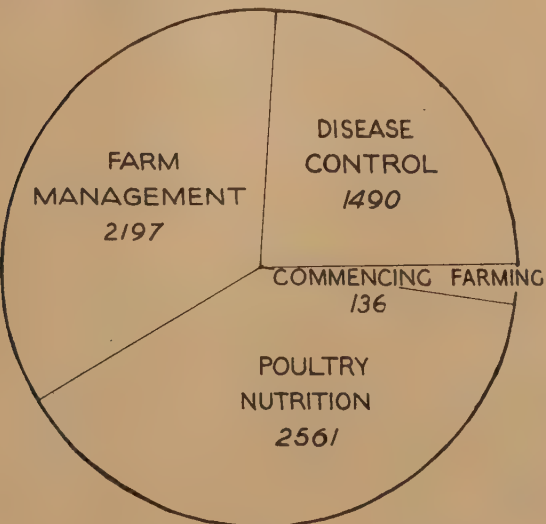


Fig. 1.

DISSECTION OF ADVICE GIVEN BY FIELD OFFICERS.

(1) It will be noted from the diagram that the greatest call for advice has been in connection with nutrition. All subjects appertaining to the feeding of poultry have been included under this heading. Advice on mash formulation and the use of sorghum

as a replacement for wheat has been sought on many occasions, no doubt due to realisation by the farmer that costs have to be reduced.

Every opportunity is taken to impress upon farmers the importance of essential vitamins. It is pleasing to be able to report that a greater number of farmers are appreciating this fact and are now seeking advice as to when and how vitamins should be used. Hatcherymen, in particular, are aware of the disastrous effects that vitamin and mineral deficiencies can have on hatchability and rearability. The practice of supplementing the rations used with vitamins and minerals is now almost universal, with a consequent improvement in the class of chicken distributed.

(2) In "farm management," housing, brooding, incubation, culling, breeding and other work connected with the work of a poultry farm have been included. Breeding stock was selected for 108 farmers. Demonstrations on culling were given to 91 farmers and on caponising, both surgical and chemical, to 56.

(3) Disease control is one of the most difficult aspects of field advisory work because the disease picture on a farm is often complicated by poor husbandry methods which the farmer, at first, is loth to accept as a contributory cause. Overcrowding, poor hygiene, lack of adequate feeding space and the use of foodstuffs unsuited to the age-group are the major husbandry faults. Much could still be done to curb the incidence of preventable diseases (e.g., fowl pox by vaccination). Branch officers gave 94 demonstrations on vaccination.

(4) Enquiries on "commencing poultry farming," although much fewer than those on other subjects, are sufficiently great to call for comment. Because of present feeding costs, the uncertainty of overseas markets and the high cost of establishing a farm, undue encouragement cannot be given to people contemplating entering the industry. Nevertheless, new ventures are being commenced.

Commonwealth Extension Services Grant.

Four demonstrations were conducted under the grant in connection with the feeding of grain sorghum to layers, two in Brisbane and two on the Near North Coast. Two hundred birds on each farm were fed mash and grain sorghum and 200 of the same age and breed mash and wheat.

Table 1 gives the hen-housed average production for 26 weeks. Table 2 shows the percentages of deaths that occurred and the culling (which is a normal farm practice) found necessary.

TABLE 1.
GRAIN SORGHUM FEEDING OF LAYERS.
Hen-housed Average Production (6 Months).

			Sorghum Group.	Wheat Group.
Farm 1	..	..	100.2	94.3
Farm 2	..	..	95.5	109.1
Farm 3	..	..	73.1	79.9
Farm 4	..	..	99.3	90.2
Mean of All Farms	..	..	91.8	93.6

TABLE 2.
GRAIN SORGHUM FEEDING OF LAYERS.
Mortality and Culling Percentages (6 Months).

			Mortality.		Culling.	
			Sorghum.	Wheat.	Sorghum.	Wheat.
Farm 1	..	..	1.5	3.0	25.5	27.5
Farm 2	..	..	6.0	3.0	42.0	38.5
Farm 3	..	..	4.0	6.0	35.0	29.0
Farm 4	..	..	2.5	5.0	30.0	36.0
Mean of All Farms			3.5	4.25	33.0	32.7

The results from these demonstrations provide useful evidence to show that sorghum may be used as the grain portion of poultry rations without adversely affecting production.

EXPERIMENTAL WORK.

Antibiotic Feeding.

In the five years that have elapsed since the discovery of the growth-increasing properties of antibiotics such as penicillin, streptomycin, aureomycin and terramycin,

a great amount of research has been carried out. The Branch has investigated under Queensland conditions those aspects of the feeding of antibiotics about which reports have varied.

Two experiments have been conducted during the period under review: (1) An investigation of the effect of buttermilk powder in a chick mash on the growth-promoting action of procaine penicillin, and (2) studies of the effect of the protein content of a mash on antibiotic response when fed to chicks reared in "new" and "old" premises.

(1) The first experiment was conducted at Kairi Regional Experiment Station. Four different rations were fed to four groups of 48 chicks from day-old to 10 weeks of age. The formulae for these rations are set out, with the results, in Table 3. Two of the rations fed contained meatmeal (15%) as the sole source of animal protein, whilst the other two contained buttermilk powder (7%) as well as meatmeal (11%). One of each of these ration types was supplemented with 15 grams of procaine penicillin to the short ton. The chicks were weighed fortnightly, feed consumption being also computed on a fortnightly basis.

TABLE 3.
ANTIBIOTIC FEEDING EXPERIMENT—No. 1.

Ration Ingredients.	Group Number and Ration Type.			
	R1— Meatmeal.	R2— Meatmeal + Peni- cillin.	R3— Meatmeal + B.M.P.	R4— Meatmeal + B.M.P. + Peni- cillin.
Maizemeal ..	25	As for R1 + 75g. procaine penicillin per 100 lb. feed.	25	As for R3 + 75g. procaine penicillin per 100 lb. feed.
Wheatmeal ..	25		22	
Bran ..	15		15	
Pollard ..	17		17	
Meatmeal ..	15		11	
Buttermilk powder	..		7	
Lucerne meal ..	2		2	
Salt premix* ..	1		1	
Vitaminised A and D ₃ ..	Fl. Oz. 2	Fl. Oz. 2	Fl. Oz. 2	Fl. Oz. 2
Results of feeding	Oz.	Oz.	Oz.	Oz.
Average weight at day-old ..	1.25	1.24	1.26	1.24
Average weight at 10 weeks ..	45.7	45.0	47.0	49.5
Feed/Gain ratio	3.11	3.2	2.99	2.94

* Every 1 lb. common salt contained 16 grams of manganese sulphate and 160 mgm. synthetic riboflavin.

The results from this experiment showed a highly significant growth response when buttermilk powder and procaine penicillin were fed together in the one ration. This finding supports the opinion expressed by some leading nutrition authorities in the U.S.A. that antibiotics exert their maximum effect when added to high-quality rations.

(2) The work on the effect of protein level and environment on antibiotic response was undertaken at Yeerongpilly Animal Health Station and the newly erected poultry section of the Rocklea Animal Husbandry Research Farm. These two places provided contrasting environments, poultry having been reared and kept at Yeerongpilly for many years, whilst at Rocklea new brooding and rearing equipment as well as new quarters for housing were available.

Recently research workers in England and America have demonstrated that antibiotics are only effective when fed to chicks housed in quarters which have been used previously for rearing poultry. It is thought that after a period of time, house and equipment harbour micro-organisms which inhabit and multiply rapidly in the intestinal tract of the chickens. The growth-promoting action of antibiotics is somehow linked with the effect they have on these micro-organisms.

Lots of 210 and 140 day-old Australorp cockerels from the same hatch were reared at Rocklea and Yeerongpilly respectively. At Rocklea the batch of 210 chicks was sorted into six groups each of 35 chicks and fed rations with protein levels of 15%, 18%, and 21% with and without the addition of procaine penicillin (15g./2,000 lb. feed). Two mashes with protein levels of 15% and 21% with and without procaine penicillin were also fed at Yeerongpilly. All mashes were mixed at Rocklea. The chicks were weighed fortnightly at each place, the final weighings being at 8 weeks of age.

The weights of the various groups at eight weeks are shown diagrammatically in Fig. 2. To show the more marked weight, increases at the "old" Yeerongpilly premises, due to the addition of procaine penicillin, the percentage weight increases of rations supplemented with penicillin compared with the average weight of chicks fed the same ration but without penicillin have been calculated from 2 weeks of age to 8 weeks or age. These are set out in Table 4.

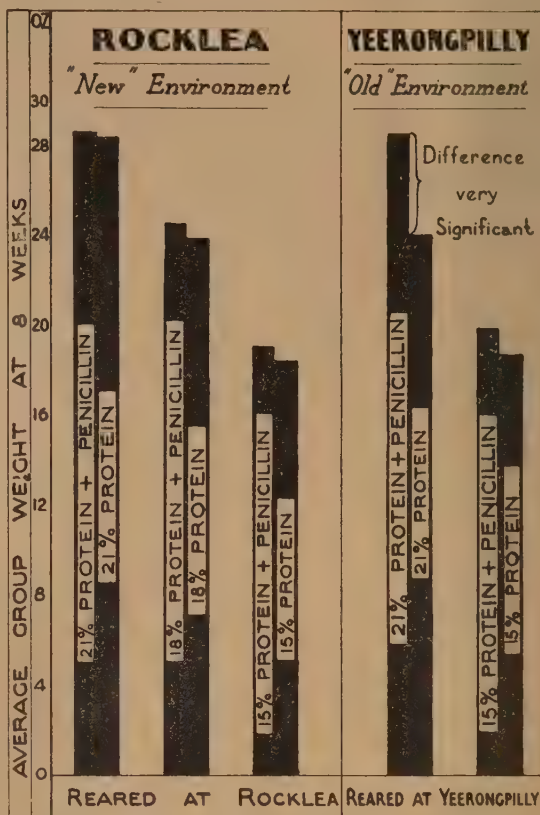


Fig. 2.
MEAN WEIGHT OF CHICKS AT 8 WEEKS AT ROCKLEA AND YEERONGPILLY.

TABLE 4.
PERCENTAGE WEIGHT INCREASES OF PENICILLIN-FED GROUPS COMPARED WITH GROUPS ON THE SAME MASH BUT WITHOUT PENICILLIN.

Week.	New Premises, Rocklea.			Old Premises, Yeerongpilly.	
	Group.			Group.	
	L + A*	N + A†	H + A‡	L + A	H + A
2	+2	+7	-2	+11	+5
4	+6	-4	+3	+11	+4
6	+4	+3	0	+14	+15
8	+3	+3	0	+5	+18

Key—

* L + A = 15% protein mash + procaine penicillin.

† N + A = 18% protein mash + procaine penicillin.

‡ H + A = 21% protein mash + procaine penicillin.

It will be seen from Fig. 2 that the only significant difference in weights occurred in the high-protein mash (21%) to which penicillin had been added. The magnitude of weight gains is shown in Table 4. It will be noted that the highest percentage weight increase for the full period found with any ration at Rocklea was 3%, compared with 18% at Yeerongpilly. The results from this work therefore indicate that antibiotics exert their effect only when fed to chicks reared in premises which have been used previously for rearing and where the level of protein in the ration is sufficiently high (under the conditions of this experiment, 21%) to ensure quick growth.

Sorghum Feeding Experiments.

Although research in other States on the use of sorghum in chick feeding had indicated that this grain had only very limited use in chick starter rations, it

was felt that the question of the reported growth-depressing effects of sorghum should be re-examined, particularly in view of the lower cost of the grain as compared with wheat and its ready availability in this State.

Two experiments have so far been conducted at the Rocklea Poultry section. The rations used contained identical amounts of bran (22 lb.) meatmeal (13 lb.), livermeal (4½ lb.) and salt (½ lb.), in addition to vitamins A, D₃ and riboflavin supplements and manganese sulphate. Only the quantities of wheatmeal and sorghum meal in each of the four rations were varied; they were as follows—Ration 1 (control) (60% wheatmeal), Ration 2 (40% wheatmeal + 20% sorghum meal), Ration 3 (20% wheatmeal + 40% sorghum meal), and Ration 4 (60% sorghum meal).

The first experiment with 160 White Leghorn day-old cockerels (4 groups of 40) was originally to end when the chickens were 8 weeks of age, but it was found that at 6 weeks of age the groups of chickens on the higher percentages of sorghum began to make up the weight differences so noticeable earlier between these groups and the groups on rations containing higher percentages of wheatmeal. By 12 weeks of age, the heaviest group of chickens was that fed Ration 3 (40% sorghum + 20% wheat), whilst the 60% wheatmeal and 60% sorghum meal mash groups were practically equal in weight, any differences in weight not being significant.

The number of deaths in each ration group did not vary significantly. It was therefore decided to repeat this work *in toto*. The results in the second trial, using White Leghorn-Australorp first cross day-old cockerels to 8 weeks of age, have shown a definite reduction in average weight as the percentage of sorghum increased in the ration.

Table 5 sets out the average weight of the four groups at day-old, 4 weeks and 8 weeks of age, for Experiments 1 and 2.

TABLE 5.
AVERAGE WEIGHTS FOR EXPERIMENTS 1 AND 2.

Ration.	Experiment 1.			Experiment 2.		
	Weight at.			Weight at.		
	Day-old.	4 Weeks.	8 Weeks.	Day-old.	4 Weeks.	8 Weeks.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
A*	1.41	9.8	27.5	1.45	11.1	32.5
B*	1.45	10.1	26.4	1.46	11.4	31.8
C*	1.45	9.5	25.5	1.42	9.5	30.9
D*	1.45	8.9	26.3	1.46	9.7	29.0

- A* = 60% wheatmeal.
- B* = 40% wheatmeal + 20% sorghum meal.
- C* = 40% sorghum meal + 20% wheatmeal.
- D* = 60% sorghum meal.

More experimental work is required on this subject. From the work carried out to date, it would appear that although chickens may not be able to utilise sorghum as efficiently as wheat during the first few weeks of life, their ability to handle large quantities seems to improve as they grow older. No evidence of toxicity has been noted.

Coccidiosis Experiments.

Before the advent of sulphonamide drugs, buttermilk powder was used extensively in rations as a treatment for caecal coccidiosis. It has been observed in a natural outbreak of intestinal coccidiosis that the chicks which suffered the greatest setback were those fed a poorer type of ration. Experimental studies were therefore undertaken in collaboration with the staff of the Animal Health Station, Yeerongpilly, to see whether the type of ration had any influence on the severity of caecal coccidiosis in chickens given measured doses of oocysts.

The chickens were wingbanded and reared in a 4-tier, electrically-heated battery brooder. Four rations were used, two of which contained buttermilk powder. At 25 or 26 days old the chickens were given a dose of oocysts individually.

Three experiments were carried out. In each experiment 200 or 240 chickens were divided into four groups, and at 3½-4 weeks of age 20 chickens in each group received 20,000 oocysts, 20 were given 10,000 oocysts and the remainder were left untreated. The chickens were then placed in wire-floored battery cages and deaths recorded in the several groups up to six weeks of age.

The rations fed in the three experiments are set out in Table 6.

TABLE 6.
RATIONS FED IN COCCIDIOSIS EXPERIMENTS.

Ingredient.	Group 1.	Group 2.	Group 3.	Group 4.
Livermeal ..	5	..	..	..
Meatmeal ..	10	12	16	12
Buttermilk powder ..	..	8	..	8
Wheatmeal ..	49	44	48	44
Bran	15	15	15	15
Pollard	20	20	20	20
Salt	1	1	1	1
Synth. riboflavin ..	..	..	160 mg.	160 mg.
Manganese sulphate ..	16 g.	16 g.	16 g.	16 g.

The effect of feeding different rations to chickens on death rate from caecal coccidiosis (up to 42 days of age), following artificial infection (at 25 to 26 days of age) is set out in Table 7.

TABLE 7.
DIET AND DEATH RATE FROM COCCIDIOSIS.

Ration Type.	Dosage of Oocysts per Chick.	Experiment 1.		Experiment 2.		Experiment 3.		Percentage Deaths All Experiments.
		Number of Chicks.	Number of Deaths.	Number of Chicks.	Number of Deaths.	Number of Chicks.	Number of Deaths.	
*M.M. + L.M. ..	0	20	0	10	0	10	0	0
	10,000	20	19	20	12	20	18	81.6
	20,000	20	18	20	14	20	18	83.3
*M.M. + B.P. ..	0	20	0	10	0	10	0	0
	10,000	20	4	20	1	20	4	15
	20,000	20	9	20	2	20	9	33.3
*M.M. + S.R. ..	0	20	0	10	0	10	0	0
	10,000	20	14	20	15	20	10	65
	20,000	20	17	20	15	20	15	78.3
*M.M. + B.P. + S.R.	0	20	0	10	0	10	0	0
	10,000	20	8	20	5	20	2	25
	20,000	20	7	20	8	20	7	36.6

- *M.M. + L.M. = 10% Meatmeal + 5% Livermeal.
- *M.M. + B.P. = 12% Meatmeal + 8% Buttermilk powder.
- *M.M. + S.R. = 16% Meatmeal + Synthetic riboflavin.
- *M.M. + B.P. + S.R. = 12% Meatmeal + 8% Buttermilk powder + Synthetic riboflavin.

Further experiments are being conducted at Yeerongpilly to study the effect of quantities of buttermilk less and greater than 8% in the ration on the incidence of caecal coccidiosis in chickens given doses of oocysts sufficiently large to produce heavy mortality

Breed Production Experiment—1st Year Production.

This experiment, covering the brooding, rearing and laying stages, commenced in July 1952 with three breeds of day-old pullet chickens at Kairi Regional Experiment Station and has now been completed.

The results of this experiment for the first year of production are set out in Table 8. From this table it will be seen that the crossbred pullets with a "hen-housed" average production of 173.7 eggs per bird bettered the Australorp group by a dozen eggs per bird and the White Leghorn group by 20 eggs per bird. Feeding efficiency as measured by the pounds of food to produce a dozen eggs also favoured the crossbreds. During the early stages of this experiment some cannibalism was prevalent in the Leghorn groups and during the later stages there was an outbreak of black comb which caused the deaths of 12 fowls. Deaths from these causes could occur, however, in any commercial flock.

TABLE 8.

RESULTS OF BREED PRODUCTION EXPERIMENT—
12 MONTHS' LAY.

	White Leghorns.	Australorps.	Crossbreds.
Number of pullets penned	186	174	180
Number of pullets after 12 months' lay	156	157	155
Number of deaths ..	30	17	25
Deaths due to—			
Cannibalism ..	12	3	0
Black comb ..	1	5	6
Eggs per bird (hen-housed average) ..	153.5	161.3	173.7
Pounds feed to produce 1 dozen eggs	6.9	6.86	6.39

Breed Production Experiment—2nd Year Production.

At the conclusion of the production experiment with pullets, the birds remaining in each group were culled to leave 90 birds per group. Second-year production, mortality and food consumption are now being recorded. The figures for egg production and food efficiency appear to be very low, but it must be remembered that during the 24 weeks the experiment has been running all breeds have been moulting. Table 9 sets out the data so far obtained for a period of 24 weeks.

TABLE 9.

RESULTS OF BREED PRODUCTION EXPERIMENT WITH
2ND YEAR HENS TO 24 WEEKS.

	White Leghorns.	Crossbreds.	Australorps.
Number of hens penned	90	90	90
Number of deaths ..	6	2	4
Eggs per bird (hen-housed average, 2nd year) ..	49.0	42.5	40.75
Pounds feed to produce 1 dozen eggs—			
2nd year	9.92	11.77	12.02

Diseases and Pest Control.

Field officers have been called upon in connection with 1,490 outbreaks of disease in poultry flocks throughout the State. The numerical importance of the various outbreaks is shown in Figure 3.

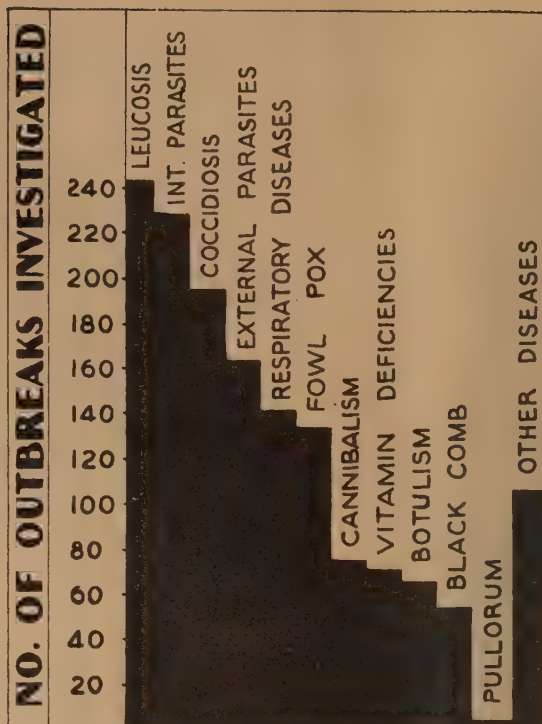


Fig. 3.

DETAILS OF DISEASE OUTBREAKS INVESTIGATED.

Respiratory Diseases.

Included in these is infectious laryngotracheitis. During the year, the presence in Queensland of the virus of this disease was confirmed. Of the first two cases one came from the Darling Downs and the other from a farm in the Brisbane area. The virus was later isolated from birds from 13 other farms, 12 of which are in the metropolitan area and one at Helidon.

For the purpose of control, a policy of vaccination was implemented. In collaboration with the Veterinary Services Branch, 23,316 birds were vaccinated on 11 properties, eight of which were commercial poultry farms. Owing to the widespread nature of the disease on the other three farms, vaccination was not carried out, although 100 males from a clean property taken on to one of them for breeding purposes were treated.

Fowl Pox.

Although vaccines have been available for many years for the control of this disease, quite a number of farmers are unaware of its value and some who are do not vaccinate regularly. Field officers carried out 94 demonstrations on the method of vaccination. In some instances the disease has occurred in young birds whilst still in the brooder. The use of pigeon pox vaccine for treatment has appeared to be of value in such outbreaks.

Black Comb.

This disease is assuming rather serious proportions from the standpoint of reduced production and actual losses. It generally attacks pullets that are well into production and at times seriously affects flock production. It may be responsible for a death rate of up to 10% of birds that have cost the farmer at least 12s. 6d. each to rear. At present there is no known method of control.

Botulism.

Although from the diagram this disease appears to be of some importance, the losses are generally confined to small flocks on range that have access to some decomposing animal or vegetable matter.

Stickfast Flea.

A flea-infested property was located at Beaudesert in December. A survey of adjoining properties showed no further infestations. Treatment was undertaken promptly and for the last two months of the year poultry and dogs in the area have been clean. The infestation is thought to be due to the introduction of a dog from the Boonah infested area by a former owner of the property.

During the same month an infested property was found at Hattouvale. Following up the movement of dogs and fowls from this property, a further eight

properties were found to be infested, extending into the boundaries of Gatton and Forest Hill. Treatment was promptly commenced and a survey of farms and household flocks in the area made. Three of the properties are now apparently free from flea, but all will be kept under observation for the next 12 months.

In the Boonah-Normanby area, although spasmodic outbreaks occur, the flea population is being reduced by the use of DDT.

Pullorum Disease.

During the year 255,140 head of poultry were tested for pullorum disease and only 1.13% reactors were removed from the flocks tested. This one-time major disease of chickens is not now a problem, as can be seen from Fig. 3. The existing policy of the compulsory blood testing of all adult birds four months and over in breeding flocks must be continued to maintain this low incidence of pullorum.

POULTRY STOCK SUPPLIERS.

During the year 208 registrations as Stock Suppliers have been made under "*The Poultry Industry Acts, 1946 to 1950*", as compared with 199 last year. Of the registrations made, 156 were for the business of hatching chickens for sale, 40 for the business of supplying fowl eggs for hatching and 11 for the business of a Poultry Dealer. Only four of those engaged in the business of hatching chickens for sale do not have a poultry flock associated with the business, and some 14 are also registered for the business of supplying eggs for hatching. Actually the breeding flocks under the scheme number 178. These vary in size from a fewer than 100 birds to nearly 9,000. Naturally the output of chickens from hatcheries varies. The actual number of chickens sold by any one Stock Supplier is not known but we have knowledge of the number of chickens sexed. In one hatchery it was 194,989 for the 12 months to November 30, 1953.

CHICK SEXING.

During the year 25 persons renewed their license for this work. The number of chickens sexed was higher than in any previous year. Table 10 sets out the number of chickens sexed for the years 1950 to 1953.

TABLE 10.
NUMBER OF CHICKENS SEXED.

1950.	1951.	1952.	1953.
2,381,100	2,411,621	1,921,276	2,699,857

POULTRY MEAT PRODUCTION.

As will be seen from Table 10, the major supply of poultry meat is hen flesh. The year opened with hens at 1s. 7d. and cockerels at 2s. 2d.; and closed at 1s. 3d. and 2s. 1d. respectively. Although returns for cockerel or chicken meat were not as attractive as they were at times in the preceding year, there was a greater stability in the market, which no doubt was responsible for the slight increase in the production of this class of bird.

Table 11 gives details of the slaughter of cockerels and hens for the years 1951 to 1954.

TABLE 11.
SLAUGHTERINGS IN BRISBANE AREA.
(Source—Brisbane Poultry Abattoirs.)

	Cockerels (Chickens).	Hens (Boilers).	Total Slaughtered.
1950-51 ..	483,876	556,493	1,158,920
1951-52 ..	574,886	637,372	1,307,095
1952-53 ..	206,101	328,315	613,844
1953-54 ..	240,049	311,444	604,725

POULTRY ADVISORY BOARD.

This Board, on which the Branch is represented, met upon three occasions. The business dealt with included consideration of a programme of experimental work to be conducted by the Branch, the conducting of a random sample egg production trial, the attendance of an officer of the Branch at the Tenth World's Poultry Congress, the estimates of the Poultry Branch and the precept to be issued on Egg Marketing Boards.

STAFF.

During the period under review two inspectors resigned, one unfortunately due to ill-health. One of the vacancies caused by these resignations was filled by the appointment of an officer who had been employed in a temporary capacity. A cadet, the holder of a diploma of the Queensland Agricultural High School and College, who had been employed temporarily was appointed to a permanent position on the staff. Two additional cadets, both diploma graduates of Gatton College, have been employed in a temporary capacity.

DIVISION OF DAIRYING.

FIELD SERVICES BRANCH.

Mr. R. A. Paul, Director of Field Services.



Mr. R. A. Paul.

The winter months of the year under review were unfavourable for dairying, due to dry and cold weather. Good soaking rains were received at the end of August in most areas, and were followed by sufficient spring rains in the Central and Upper Burnett, Callide and Dawson Valleys and in the south-east. Elsewhere dry weather prevailed and conditions were unfavourable.

During this period fires were responsible for considerable loss of feed in the Rockhampton area.

Early summer weather was unusually hot and dry, with high humidities on the coast. Storm rains fell in late December, continuing through January and culminating in very heavy rains causing floods in February. Autumn rainfall was well below average, other than on the Atherton Tableland, but good rains in early June have brightened prospects for the winter.

Table 1 gives some statistics for the past seven years.

TABLE 1.
SUMMARY OF PRODUCTION STATISTICS.

Year.	Dairy Cattle.* (000).	Dairy Cows in Milk and Dry.* (000).	Butter Production.† (tons.)	Cheese Production.† (tons.)	Total Milk Gallonage† (000,000).
1947-48	1,382	923	46,454	9,641	273
1948-49	1,423	930	47,187	9,410	277
1949-50	1,433	927	48,197	9,170	281
1950-51	1,440	928	47,402	8,674	278
1951-52	1,296	828	27,850	4,700	180
1952-53	1,373	868	49,425	9,439	286
1953-54	1,383	915	41,798	6,746	250

* As at March 31.

† For year ending June 30.

BUTTER PRODUCTION.

Quantity.

The production of butter for the year was 41,798 tons. This is 15% below the quantity produced in the previous year. It is necessary to go back to the year 1944-45 to record as low a tonnage, if the drought years of 1946-47 and 1951-52 are excepted.

The trend of production over the past seven years is shown in Fig. 1.

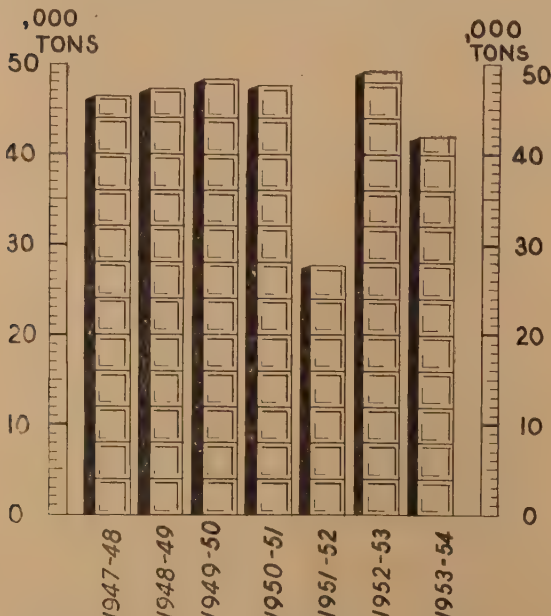


Fig. 1.

QUEENSLAND BUTTER PRODUCTION 1947-48 TO 1953-54.

Quality.

The official gradings for the year are shown in Table 2, whilst Table 3 gives the quality as designated on the factory platform.

TABLE 2.
OFFICIAL GRADINGS OF BUTTER.

Grade.	1951-52.	1952-53.	1953-54.
Choice	% 32.45	% 46.96	% 29.81
First	60.03	46.75	61.71
Second and Pastry	7.52	6.29	8.48
Percentage of butter graded ..	61.90	80.30	75.54

TABLE 3.
FACTORY GRADINGS OF BUTTER.

Grade.	1951-52.	1952-53.	1953-54.
Choice	% 71.10	% 64.94	% 59.38
First	26.16	31.49	37.33
Second	2.74	3.57	3.29

There has been no movement in the price paid to the farmer during the year. The Dairy Industry Investigation Committee determined a figure of 1.72d. in excess of that of the Commonwealth Government's guaranteed price for the previous year. However, the Committee expressed the opinion that any action which might increase the proportion of butter sold on the overseas market might endanger the stability of the industry. As a consequence the guaranteed price was not increased.

Restriction of the subsidy to butter sold on the local market plus an amount of export butter equal to 20% of local sales still continues. Farmers generally are receiving an interim price of 3s. 10½d. per lb. commercial butter, equivalent to 4s. 8.7d. per lb. butterfat.

Factory Buildings and Equipment.

The structural condition of the 52 butter factories is generally satisfactory. Approximately £178,000 has been spent during the year in the purchase of new equipment. A significant development has been the purchase of modern cream-tipping devices, power conveyors and straight-through can washers. Such equipment greatly facilitates the handling of cream. New pipelines of stainless steel construction and mechanical butter packers of the all-metal type are other types of improved equipment being installed in factories.

Four factories have decided to replace the volatilisers at present in use with tandem vacreators, whilst one factory has installed a solo vacreator to replace a volatiliser.

Major items of equipment installed include 8 churns, 6 churn barrels, 14 cream holding vats, 6 neutralising vats, 7 metal butter packers, 4 printing and wrapping machines, 3 plate-type cream coolers, 2 hot-water tanks and one buttermilk roller-drying plant.

It is pleasing to be able to record such progress in the installation of modern equipment. The factories responsible are to be congratulated for their progressive outlook, which augurs well for quality improvement in the future.

CHEESE PRODUCTION.

Quantity.

Production of cheese for the year was 6,746 tons. This is considerably less than the amount expected in a normal year, and is 29% below the quantity manufactured in 1952-53.

Fig. 2 shows the trend in production since 1947-48.

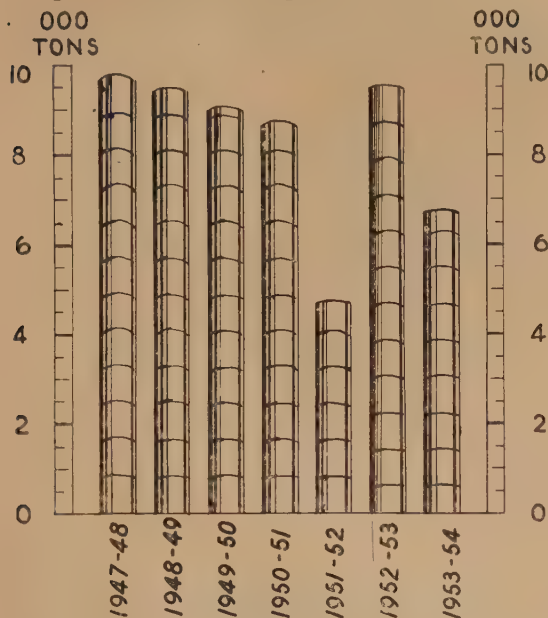


Fig. 2.

QUEENSLAND CHEESE PRODUCTION 1947-48 TO 1953-54.

Quality.

The quality of cheese graded was not as good as in the previous year. However, quality showed an improvement on all other years since 1949-50, when 79.8% was graded into choice and first quality. The gradings are shown in Table 4.

TABLE 4.
OFFICIAL GRADINGS OF CHEESE.

Grade.	1951-52.	1952-53.	1953-54.
Choice and First	68.26	86.3	77.68
Second	30.64	13.2	20.74
Third	1.10	.5	1.58
Percentage of cheese graded ..	38.50	61.5	58.66

Under the Commonwealth Government's guaranteed prices plan, no change has been made in the price paid for milk for cheesemaking during the year. The following costs are recognised:—

Farm costs 237s. 0.6d. per cwt.

Factory costs 40s. 9.66d. per cwt.

Farmers are receiving an interim price of 5s. per lb. butterfat.

Factories and Equipment.

Very little has been done in the way of structural alterations to factory premises during the year. In general, the condition of factories is satisfactory. Four factories ceased operation, leaving a total of 34 cheese factories operating. Of this number, only four small factories are now manufacturing cheese from unpasteurised milk.

Approximately £35,000 was spent on the purchase of new equipment. The major items installed include 3 enclosed plate-type and 1 flash pasteuriser, 4 making vats, 2 can washers, 1 whey separator, 4 cheese presses and 1 curd mill.

Equipment generally is satisfactory and in good condition in all but three of the smaller factories. Some factories have shown a marked improvement in the quality of cheese marketed, and it is hoped that this lead will be followed by some of the smaller factories in the coming year.

MARKET MILK PRODUCTION.

Milk production for the market milk supply was satisfactory throughout the year. The percentage of milk being drawn from country factories by the Brisbane milk market continues to increase, and during the year was approximately 70% of the total supply; 90% of milk from country factories is delivered to metropolitan factories in insulated stainless steel tankers.

Milk quality was generally satisfactory, although some compositional quality troubles were experienced during the dry late winter and early spring when because supplies were low, cows in late lactation were milked longer than advisable. Low butterfat tests during the period July to October were not as numerous as usual in these months.

Following electrification of further rural areas, there has been an increase in the number of mechanical refrigeration units on milk producing farms. The dry air refrigeration storage system, following shock cooling of milk, appears to be gaining in popularity.

There has been a noticeable improvement in the standard of milk factory buildings and equipment during the year. In the metropolitan area one company, following a change of ownership at the beginning of the year, carried out a complete overhaul of factory equipment and further new equipment is on order. A second company's factory is being remodelled, and extensions, together with new equipment, should be completed early in the new financial year. A start on the foundations for a complete new milk treatment factory has been made by a third company. Improvements to factories and equipment outside the metropolitan area have also been made.

The Government subsidised School Milk Scheme, which commenced last year, was extended to further country centres where supplies of pasteurised milk are available. The scheme is operating satisfactorily in all areas. It is estimated that approximately 74% of all eligible children in Queensland are now receiving bottled pasteurised milk daily at school.

Consumption of market milk is increasing annually, as Table 5 shows.

TABLE 5.
MILK CONSUMPTION IN BRISBANE.

Year.	Consumption (Million Gallons).
1947-48	11.2
1948-49	11.9
1949-50	12.5
1950-51	13.6
1951-52	14.0
1952-53	14.4
1953-54	15.6

The price paid to producers of market milk remained the same as last year—3s. per gall. during the summer price period, equivalent to 7s. 8d. per lb. butterfat at the average fat content of 3.8%, and 3s. 4d. per gall. during the winter price period, equivalent to 8s. 6d. per lb. butterfat.

MILK DRYING AND CONCENTRATING.

Owing to a price decrease on overseas markets, milk drying has tended to decline. Roller drying of skim-milk has been intermittent and was mainly carried out to fulfil local and interstate orders. Drying of buttermilk is being carried out at several butter factories; the product is used partly for ice cream manufacture but mainly as stock food. One spray-drying plant began to operate on limited supplies of skim-milk; this product is being prepared for human consumption. The new milk products factory at Gympie is processing milk as roller-dried full-cream powder. This product is being used mainly in the manufacture of confectionery and ice cream.

MARGARINE PRODUCTION.

Production of table margarine continued to show a slight increase over the year, but a levelling out over recent months is now apparent.

Table 6 gives for the past six years the quantity of table margarine manufactured and the quota.

TABLE 6.
QUANTITY OF TABLE MARGARINE MANUFACTURED.

Year.				Manufacture.	Aggregate Quota.
				Tons.	Tons.
1948-49	..	..	..	646	645
1949-50	..	..	..	659	645
1950-51	..	..	..	438	645
1951-52	..	..	..	784	1,600
1952-53	..	..	..	1,180	6,860
1953-54	..	..	..	1,710	4,236*

* Reduced to 4,236 tons in July, 1954.

General improvements in the standard of buildings and equipment are being carried out in connection with the manufacture of table margarine. Trial batches have been made at the new factory at Murarrie and normal production is expected in the near future. The factory being erected at Cannon Hill is showing good progress and production is expected to commence towards the end of 1954. Very modern equipment is being installed at both of these factories. Only one factory is manufacturing table margarine in the State; two factories are processing prepared oils; another factory packs table margarine from bulk margarine manufactured in another State; and a further factory is selling table margarine which is manufactured and packed outside the State.

TABLE 8.
RESULTS OF PURE BRED COWS TESTED, ACCORDING TO BREED.

Breed.	—	Total Cows.		Passed.		Failed.		Withdrawn.	
		1952-53.	1953-54.	1952-53.	1953-54.	1952-53.	1953-54.	1952-53.	1953-54.
		No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %
A.I.S.	..	359 ..	572 ..	186 51.8	247 43.1	142 39.6	245 42.9	31 8.6	80 14.0
Ayrshire	..	47 ..	36 ..	34 72.3	20 55.6	9 19.1	14 38.9	4 8.5	2 5.6
Friesian	..	9 ..	11 ..	3 33.3	3 27.3	6 66.7	5 45.5	..	3 27.3
Guernsey	..	65 ..	90 ..	28 43.1	51 56.7	36 55.4	18 20.0	1 1.5	21 23.3
Jersey	..	602 ..	832 ..	309 51.5	374 45.0	226 37.5	392 47.1	67 11.1	66 7.9
Red Poll	..	5 ..	17 ..	..	..	5 100	6 35.3	..	11 64.7
Totals	..	1,087 ..	1,558 ..	560 51.5	695 44.6	424 39.1	680 43.7	103 9.5	183 11.8

It will be seen from the table that a total of 695 cows (44.6%) reached the required age-production standard, compared with 560 (51.5%) in 1952-53.

HERD IMPROVEMENT SERVICE.

During the year increased numbers of herds and cows were submitted for recording under both the Official Pure Bred and the Group Herd Production Recording Schemes.

Pure Bred Dairy Cattle Production Recording Scheme.

The number of herds recorded was 146, an increase of 28 over the previous year. In order to provide service for the increased number of herds, two additional Recording Officers were appointed. These officers are stationed at Kingaroy and Monto.

The number of cows recorded under the Scheme during the past five years, together with their average production, is shown in Table 7.

TABLE 7.
SUMMARY OF PURE BRED PRODUCTION RECORDING.

Year.	No. of Cows.	Average Production per Cow.		
		Milk.	Test.	Butterfat.
		Lb.	%	Lb.
1949-50	1,064	6,608	4.7	310
1950-51	1,153	5,917	4.5	271
1951-52*	885	5,571	4.7	259
1952-53	984	6,247	4.6	290
1953-54	1,375	5,860	4.6	271

* Drought year.

The numbers of cows of each breed which were submitted to test, together with the numbers and percentages which passed or failed to reach the age-production standards, are shown in Table 8. The numbers of cows withdrawn are also shown.

Table 9 shows the average production, according to breed and age groups, of cows which completed lactation periods of 273 days or less.

TABLE 9.
RESULTS OF PURE BRED COWS, IN AGE GROUPS AND BREEDS, WHICH COMPLETED LACTATIONS OF 273 DAYS OR LESS.

Breed.	—	J.2.	J.32.	J.3.	S.3.	J.4.	S.4.	Mature.	All Cows.
A.I.S.	No. of Cows	163	93	59	42	38	17	80	492
	Milk (lb.)	6,113	6,590	6,734	6,883	7,384	7,270	8,597	6,881
	Butterfat (lb.)	243	258	258	298	287	284	347	274
	Test (%)	4.0	3.9	3.8	4.3	3.9	3.9	4.0	4.0
Ayrshire	No. of Cows	14	3	3	2	5	1	6	34
	Milk (lb.)	5,614	8,874	7,390	4,629	5,756	6,631	8,229	6,501
	Butterfat (lb.)	246	377	322	214	229	331	364	283
	Test (%)	4.4	4.2	4.4	4.6	4.0	5.0	4.4	4.4
Friesian	No. of Cows	6	..	1	1	..	..	..	8
	Milk (lb.)	6,904	..	6,844	4,701	..	..	..	6,621
	Butterfat (lb.)	233	..	225	163	..	..	..	223
	Test (%)	3.4	..	3.3	3.5	..	..	..	3.4
Guernsey	No. of Cows	24	21	7	5	1	2	9	69
	Milk (lb.)	5,256	5,530	6,724	6,908	2,811	6,646	8,875	6,085
	Butterfat (lb.)	252	267	346	367	122	360	431	299
	Test (%)	4.8	4.8	5.1	5.3	5.5	5.4	4.6	4.9
Jersey	No. of Cows	291	102	69	51	48	45	160	766
	Milk (lb.)	4,575	4,651	5,150	5,478	5,995	5,962	5,919	5,166
	Butterfat (lb.)	235	235	270	294	323	307	306	267
	Test (%)	5.1	5.0	5.2	5.1	5.4	5.1	5.2	5.2
Red Poll	No. of Cows	1	2	2	..	..	..	1	6
	Milk (lb.)	3,048	3,407	3,513	..	..	..	3,885	3,462
	Butterfat (lb.)	110	124	131	..	..	..	141	127
	Test (%)	3.6	3.7	3.7	..	..	..	3.6	3.7

All ages and breeds :—No. of Cows, 1,375 ; Milk, 5,860 lb. ; Butterfat, 271 lb. ; Test, 4.6 per cent.

During the year the fourth annual report on Pure Bred Production Recording was published. In order to curtail the expense and time involved in typesetting, this report was printed by the photo-offset method, which proved entirely satisfactory.

Register of Merit.

The Register of Merit for Dairy Cattle is focussing attention on the need to assess an animal's worth on a lifetime production basis rather than on only one lactation record. The second supplementary list was published this year. Table 10 shows the number and breed of cows and bulls which have qualified for entry into the various sections of the Register.

TABLE 10.
SUMMARY OF DAIRY COWS IN REGISTER OF MERIT.

Section.	A.I.S.	Ayr-shire.	Friesian.	Guernsey	Jersey.	Total.
Intermediate	23	1	..	3	66	93
Lifetime	8	..	1	1	13	23
Elite ..	2	..	..	..	1	3

Sire Register of Merit—A.I.S., 1; Jersey, 2.

Group Herd Recording Scheme.

During the year five new herd recording groups commenced operation, bringing the total number of groups to 55. Two of the new groups are situated in the Dawson-Callide area and there are now herd recording groups in all the major dairying districts of the State. Interest in this scheme is increasing and applications have been received for a further 10 groups to commence in the coming year.

The group herd recording year ends on September 30 each year, and for the period ending September 30, 1953, a total of 34,304 cows in 1,073 herds completed lactations, with an average production of 348 gall. of milk and 150 lb. butterfat.

The growth of the scheme since 1948 and the average production per cow for each year are shown in Table 11.

TABLE 11.
NUMBER OF COMPLETED LACTATIONS AND AVERAGE PRODUCTION PER COW FOR EACH YEAR SINCE 1948.

Year.	No. of Herds.	No. of Completed Lactations.	Average Production per Cow.		
			Milk.	Test.	Butterfat.
1948-49	507	17,216	329	4.3	144
1949-50	715	22,392	352	4.3	152
1950-51	814	26,798	331	4.4	146
1951-52*	818	23,123	266	4.2	112
1952-53	1,073	34,304	348	4.3	150

* Drought year.

Table 12 shows the number of cows, their average production and length of lactation according to age groups.

TABLE 12.
NUMBERS AND AVERAGE PRODUCTION AND LENGTH OF LACTATION OF GROUP COWS ACCORDING TO AGE.

Age Group.	No. of Cows.	Average Length of Lactation.	Average Production per Cow.		
			Milk.	Test.	Butterfat.
2 years..	3,854	Days.	Gallons.	%	Lb.
3 years..	3,875	204	282	4.5	126
4 years..	3,872	207	314	4.4	138
Mature..	15,676	214	353	4.4	155
Unknown	7,027	213	369	4.3	158
Totals	34,304	208	351	4.3	149
			348	4.3	150

The average length of completed lactations is 210 days (7 months). The economic loss involved in this short lactation period is considerable, and this aspect of dairy cattle husbandry calls for attention by all concerned.

For the 1952-53 year, cows which milked for a full 270-day period produced on the average 195 lb. butterfat, compared with 130 lb. produced by cows which milked for a shorter period, a difference of 65 lb. butterfat between the two groups. This quantity of butterfat is equivalent to 79 lb. of commercial butter, valued at

£15 16s. on present prices. As 69% of the cows which completed lactations milked for a shorter period than 270 days, these short lactation periods are a very serious loss to the dairying industry. Such a position would be corrected to a very large extent by the provision of sufficient fodder to enable the cows to milk for a full lactation period and by arranging that cows calve during the optimum months of July to September.

The effect of the length of lactation on cows in various age groups is shown in Tables 13 and 14.

TABLE 13.
AVERAGE PRODUCTION PER COW, ACCORDING TO AGE OF COWS WHICH MILKED FOR A FULL LACTATION PERIOD OF 270 DAYS.

Age Group.	No. of Cows.	Average Production per Cow.		
		Milk.	Test.	Butterfat.
		Gallons.	%	Lb.
2 years ..	1,253	382	4.5	172
3 years ..	1,154	412	4.5	184
4 years ..	1,193	443	4.4	196
Mature ..	4,779	472	4.3	205
Unknown ..	2,170	450	4.3	192
Totals ..	10,549	447	4.4	195

TABLE 14.
AVERAGE PRODUCTION PER COW, ACCORDING TO AGE, OF COWS WHICH COMPLETED LACTATION PERIODS OF LESS THAN 270 DAYS.

Age Group.	No. of Cows.	Average Production per Cow.		
		Milk.	Test.	Butterfat.
		Gallons.	%	Lb.
2 years ..	2,601	234	4.5	104
3 years ..	2,721	272	4.4	119
4 years ..	2,679	313	4.4	137
Mature ..	10,897	324	4.2	138
Unknown ..	4,857	307	4.2	130
Totals ..	23,755	304	4.3	130

The average production in various major districts is shown in Table 15.

TABLE 15.
AVERAGE PRODUCTION ACCORDING TO DISTRICT, OCT. 1, 1952, TO SEPT. 30, 1953.

District.	Herds.	Cows.	Average Production.		
			Milk.	Test.	Butterfat.
			Galls.	%	Lb.
Atherton Tableland	97	2,845	409	4.1	169
Mackay ..	19	493	264	4.7	124
Rockhampton ..	24	541	253	4.5	113
Port Curtis ..	22	625	283	4.6	129
Upper Burnett ..	22	1,300	384	4.0	155
Central Burnett ..	55	1,370	331	4.5	149
South Burnett ..	161	4,777	328	4.2	137
South - Eastern Queensland ..	464	16,221	327	4.5	146
Eastern Downs ..	121	3,402	435	4.2	181
Western Downs ..	88	2,730	373	4.1	154
All Queensland ..	1,073	34,301	348	4.3	150

Numerous instances are available of the improvement shown in production by individual farmers since commencing group herd recording. One of the outstanding examples is from a herd in the Cedar Pocket Group, near Gympie. The average production of this herd for each year since 1948 is given in Table 16. The improvement in the production is due largely to close co-operation between the owner and officers of the various Divisions of this Department in relation to farm and herd management practices.

TABLE 16.
PRODUCTION RECORDS OF A HERD IN THE CEDAR POCKET GROUP, SHOWING IMPROVEMENT IN PRODUCTION SINCE COMMENCING RECORDING.

Year.	No. of Cows.	Average Production per Cow.			Increase in Total Farm Production.
		Milk.	Test.	Butterfat.	
		Gallons.	%	Lb.	%
1948-49	49	261	5.2	137	..
1949-50	53	325	5.2	169	33
1950-51	44	429	5.2	221	45
1951-52*	44	442	5.1	225	47
1952-53	67	454	5.2	234	134

* Drought year.

Surveys.

Surveys of data collected from members of the Group Herd Recording Scheme have been continued, and the following surveys have been brought up to date:—

- (a) Effect of month of calving on production.
- (b) Effect of length of lactation on production.
- (c) Production according to test.

The Effect of Month of Calving on Production survey now covers the period 1948-1953 and shows that for most of the State a definite advantage is gained by calving cows in the third quarter of the year. The optimum period varies slightly between districts.

The survey now includes 117,476 lactations. Table 17 shows that the period July to September is the best in which to have cows freshening. Unfortunately, only 31% of the cows are calving in these months. With proper control of the bull and correct mating methods, it is not unreasonable to expect that 80% of cows calve down in the months of July, August and September. If this were achieved, a very significant increase in production, equivalent to some 4,300 tons of butter yearly from the dairy cow population of the State, would result.

TABLE 17.
EFFECT OF MONTH OF CALVING ON PRODUCTION.

Period.	No. of Cows.	Percentage of Cows.	Milk.	Butterfat.
			Gallons.	Lb.
January-March ..	22,191	18.8	292	127
April-June ..	20,758	17.7	338	145
July-September ..	36,150	30.9	361	157
October-December	38,376	32.6	322	140

The Effect of Length of Lactation on Production survey shows that for the 1952-53 year, 31% of the cows milked for a period of 270 days for an average production of 195 lb. butterfat, and 21% milked for less than six months for an average production of 71 lb. butterfat—that is, a difference of 124 lb. butterfat. Such differences in production emphasize the need for better herd and farm management, more particularly the provision of adequate supplies of feed to enable the cows to milk for a full lactation period.

Production According to Test.—This survey has shown that, within each breed, there is a strong correlation between butterfat content and the yield of butterfat. The work is being continued and the results are being used by advisory officers.

Herd Wastage.

The collection of data has been continued. A significant decrease in the wastage due to udder troubles has taken place over the last few years. Further work is to continue on these surveys.

Comparison of Production as Shown by Herd Recording and Factory Returns.

A survey conducted on 382 farms showed that the average amount of produce supplied to the factories was 93.3% of the recorded production. For 289 farms which supplied butter factories the percentage was 91.5%, and for 93 farms supplying cheese or milk factories it was 96.6%.

Extension Work.

To enable farmers who are recording to obtain the maximum benefits from the scheme, staff of the Herd Recording Section have carried out extension work to a much greater extent than has been the case in previous years. Meetings of farmers' organisations have been attended, radio broadcasts given and visits made to individual farms. During the year members of the staff addressed 36 meetings and gave 11 radio broadcasts.

DAIRY INDUSTRY EXTENSION GRANT.

This Grant from the Commonwealth Government was renewed from July, 1953, for a further period of five years. A condition imposed by the Commonwealth reduced the amount to be expended from the Grant on Group Herd Recording from one-third of the cost to one-quarter.

Activities of the Grade Herd Recording Scheme are presented elsewhere in this report. Other projects supervised by the Branch include—

- Development of farm demonstrations and conduct of field days.
- Operation of a Mobile Film Unit and photography of farm management practices.
- Cheese milk cooling demonstrations.
- Special displays.
- Subsidised interstate transport of herd sires.

Farm Demonstrations.

Under the demonstration farm scheme operating in the first 5-year term of the Grant, many aspects of herd and farm management were undertaken on each farm. During the present 5-year period, however, it is intended to confine work on each selected farm to only one aspect of management. Each demonstration is to be confined to a limited area of the farm.

Demonstrations have been continued on 25 farms which were retained from the first period of the Grant, and a further 57 new farms were selected.

The selection of co-operators was finalised after consultation with the local branches of the Queensland Dairymen's Organisation.

The practices being demonstrated include the establishment and management of both irrigated and dry land pastures, strip grazing of pasture and fodder crops, fodder conservation with the use of a buck-rake, and legume establishment in existing pastures.

The objective of these demonstrations is to establish on the properties of the co-operators situations that will constitute result demonstrations. During the course of the work material will also be provided for method demonstrations. These properties will then become the focal point for extension work among other farmers in the area.

The demonstrations are distributed as far as possible in proportion to the relative concentration of dairying activities in each district. They are also centred on the local Herd Recording Group and all co-operators are now members.

Each demonstration is being made large enough to demonstrate the techniques and their application to farm planning. They are being planned on a large enough scale to allow of the results being measured in terms of either increased production or increased carrying capacity. Each co-operator is encouraged to use his own initiative and resources as much as possible.

The 82 farm demonstrations at present being developed include:

Improved dry-land pastures ..	..	..	46
Irrigated pastures—flood and spray ..	..	..	20
Strip grazing of fodder crops ..	..	..	11
Fodder conservation ..	..	..	5

Many of the demonstrations have not progressed sufficiently to allow of any follow-up extension work. In the coming year it is expected that a large number of field days and conducted tours will be arranged so that neighbouring farmers will have the opportunity of discussing the results achieved.

Four field days have been held on the properties of the co-operators and all have been well attended. One of these days featured the use of the buck-rake in the construction of two wedge silos. Unfortunately, the equipment was received too late in the season for the use of other farmers. Judging from the interest at the demonstration, farmers in the area will be conserving fodder by this method in future years.

The use of the sod-seeder for oversowing and fertilizing existing pastures was demonstrated at another field day. The use of this equipment is expected to become popular, and as a result the carrying capacity of pastures should be increased.

Two other field days featured the establishment and management of green panic and lucerne and buffel grass and lucerne pasture mixtures. These pastures show excellent promise in a number of districts. Many other farmers are following the lead and obtaining excellent results.

Film Unit and Photography.

The unit completed itineraries in the central, northern and lower southern areas. Ninety-eight screenings were conducted to audiences totalling approximately 6,000 people.

Considerable mechanical trouble was experienced with the film unit vehicle, culminating in a major breakdown in December. Repairs were effected but these provided only temporary relief. The vehicle was finally condemned as being unroadworthy in early April. It has been decided not to replace the unit. All senior field officers have now been equipped with 35 mm. cameras for use in recording progress on the farm demonstrations. It is intended to build up an extensive library of both black and white and coloured slides and film strips. These are to be used at farmers' meetings and discussion groups as a means of drawing attention to, and stimulating interest in, practices being demonstrated on the farms. To date slides depicting items of local interest have been used at several farmer meetings and have been commented on most favourably.

Cheese Milk Cooling.

In addition to the 10 demonstrations which operated in the previous year and which have been continued, six others have been commenced. These are located in cheese areas which had not previously had the benefit of such a demonstration. Some alterations in the design of the tower coolers have been made in the newer ones. This has been done with a view to lowering the cost of construction and giving a longer life.

Temperatures of both cooled and uncooled milks are taken monthly on each farm and quality tests are performed. All results are recorded and these will be collated when sufficient are to hand. They will be used by the extension officers in the course of visits to dairy farms in connection with quality improvement.

Special Displays.

An exhibit was prepared for the Royal National Exhibition, illustrating the function of herd recording in dairy farm management. The success achieved by several farmers in increasing production was the highlight of the exhibit. It attracted considerable interest in Brisbane and also at the larger country shows where it has since been exhibited.

Sire Subsidy.

During the year only two farmers applied for and received assistance. Both bulls were of the Jersey breed.

GENERAL.

Rebate of Freight on Bulls.

Applications were approved in respect of the refund of rail freight, intrastate, of 130 bulls, the progeny of female stock entered in the Advanced Registers of the various Breed Societies. The expenditure amounted to £1,162.

Milking Machine Survey.

A survey carried out by field officers during the year shows that 16,546 farmers (80.6%) are using milking machines. The average number of units per machine is 3.3. A total of 691 new machines was installed in 1953-54.

Dairy Buildings.

As a result of building materials being more readily available, many new premises have been erected and others undergone major renovations. New premises numbered 555 and renovated buildings 506.

Various Activities.

A good deal of the time of the officers of the Branch is taken up in the administration of the Dairy Produce Acts on farms and in factories. The officers are also responsible for the conduct of examinations for appointment as Dairy Officers and for Certificates of Competency under the Dairy Produce Acts. Other activities include examination of factory accounts; statistics of butter and cheese manufacture, pay out and grades; transport of dairy produce; and general extension work with groups and individual farmers.

Testing of herds entered in the Official Pure Bred Production Recording Scheme is also done in the field where insufficient herds are available to warrant the appointment of a testing officer.

Table 18 gives some information in relation to farm and factory visits. Separate statistics are also included showing farm and factory visits made by officers of the Brisbane Milk Board and Branch field officers to registered Milk Board suppliers and milk factories.

TABLE 18.
SUMMARY OF FIELD STATISTICS, 1953-54.

Districts.	Farm Visits.	Factory Visits.		Milk.	Suppliers Tests.	Factory Tests.
		Butter.	Cheese.			
Brisbane	3,375	388	..	127	3,668	550
Brisbane (Milk Quality Control)	3,751	107	6	459	23,238	401
Downs (Toowoomba)	4,423	253	102	44	13,461	1,404
Downs (Warwick)	2,500	184	100	88	7,742	3,308
Rockhampton	2,709	192	17	97	944	4,031
Maryborough	3,150	331	31	127	1,693	711
Murgon	631	89	3	1	41	565
Gympie..	4,986	348	28	90	2,745	3,567
Northern	981	73	..	53	2,785	458
	26,506	1,965	287	1,086	56,317	14,995

	Farm Visits.	Factory Visits.
Milk Board Officers	1,917	522
Divisional Officers	2,296	1,403
	4,213	1,925

Staff.

One officer resigned his position during the year, five new appointments were made and four transfers were effected.

DAIRY RESEARCH BRANCH.

Mr. L. E. Nichols, Director of Research.



Mr. L. E. Nichols.

The Research Branch has continued to give technical aid to the dairying industry and investigations have been conducted into bacteriological, chemical and manufacturing problems.

A feature of the year has been the marked increase in routine work undertaken in the regional laboratories at Toowoomba, Murgon and Malanda and the sub-laboratory at Hamilton.

The Toowoomba laboratory gave attention to problems of the cheese industry, especially cheese starter cultures and bacteriophage, whilst the Brisbane laboratory concentrated on special investigations and problems of market milk and milk by-products.

Efforts have been made to encourage greater efficiency in the industry by the intensification of laboratory control schemes for market milk, butter and cheese.

DECENTRALISATION OF TECHNICAL SERVICES.

A new dairy laboratory was established at Malanda with the co-operation of the North Queensland Marketing Federation and the Atherton Tableland Co-operative Butter Association, and is now giving a much appreciated technical service to farmers and factories in North Queensland. Following approval for the establishment of a laboratory within the Butter Marketing Board's new building at Hamilton, fittings and equipment have been purchased. It is expected that the new laboratory will commence operations towards the end of this year. The improved facilities will allow a considerable expansion in service to the butter industry and the scope of research activities.

A technical officer has been transferred to Toowoomba in order to assist with chemical problems of the industry on the Darling Downs and in particular to study the cheese-yielding capacities of milk supplies to cheese factories.

DAIRY SCHOLARSHIPS.

There has been a further strengthening of the technical service provided to the dairying industry with the return to Queensland of the third scholarship holder who had been trained in New Zealand. This officer is now specializing on market milk and milk by-products.

STUDY OF OVERSEAS DAIRYING PRACTICES.

With a view to obtaining first-hand knowledge of overseas developments in dairying, the Director of Research attended the 13th International Dairy Congress at the Hague, Holland, as an Australian delegate and afterwards studied dairying in important dairying countries in Western Europe, the United Kingdom and America.

The report to this Department giving the results of observations was forwarded to the Commonwealth Government and various State authorities. The observations were also publicised throughout the State with the aid of illustrated lectures, articles and radio talks.

Sustained efforts are being made to apply the knowledge gained overseas to the dairying industry in Queensland. As trends in other countries are aimed at improving quality and producing dairy produce with economy, this object is being particularly kept in mind. Other developments receiving attention and considered worthy of application here include improved and more economically operating processing equipment (*e.g.*, automatic crating and decrating devices for bottled milk); rapid cheesemaking methods; in-place chemical cleaning of dairy equipment; reconstituted milk from skim-milk powder and butteroil; utilisation of skim-milk powder and buttermilk powder in bread; improved packaging of cheese; and fancy cheese manufacture.

It is hoped that some of the practical lessons learned from overseas can be introduced with benefit to the industry in this State.

INVESTIGATIONS.

Reconstituted Milk.

The increasing use of reconstituted milk overseas to overcome milk shortages suggests that this product could be a nutritionally valuable and welcome food for certain areas in Queensland. Such a development would also be a means of increasing the demand for locally produced skim-milk powder. Experiments are being conducted to determine the suitability of locally obtainable ingredients for the manufacture of reconstituted milk.

The experiments so far indicate that a palatable product can be produced which should be acceptable to consumers in areas where supplies of fresh milk are inadequate. It has been found possible to produce a butteroil suitable for the purpose, provided the butter used in its manufacture is carefully selected on tests to determine its susceptibility to oxidation. Only the highest quality low-temperature preheat spray-dried skim-milk powder and butteroil free from oxidation should be used, to ensure that the flavour of the milk is not impaired. The possibility of using vacreator-treated cream and unsalted butter as sources of fat in some areas will also be explored.

Milk By-Products in Breadmaking.

The inclusion of milk by-products in bread is now widely practised overseas and has given a product of improved texture and keeping quality. Several experimental batches of milk-bread have been made using locally produced skim-milk powder and buttermilk powder. A high-temperature preheated milk powder to which glyceryl monostearate is added is necessary. Buttermilk without the addition of this compound has also been tried. The inclusion of 4% of these powders in the dough has given satisfactory results, the bread produced having a better texture and keeping quality than normal bread.

Compositional Quality of Market Milk.

Investigations in overseas countries have shown that the supplementary feeding of long roughage to dairy cows, at certain times of the year, has improved the compositional quality of the milk, especially the butterfat percentage. There is a serious decline in milk composition during the late winter and early spring months in this State, and some improvement has been effected by feeding good long hay.

In the Beaudesert district, on two farms which were supplied with white panicum and Sudan grass seed, sufficient long hay was harvested from the resultant crops to enable feeding demonstrations to be commenced towards the end of July, 1953.

On these two farms two groups of carefully paired cows were selected, one group being fed an additional ration of 5 lb. per day per cow of long Sudan grass hay, in addition to the normal feed and rations available to all of the herd. This additional ration was fed after the night's milking, whilst the usual milking interval was maintained. The feeding of hay was carried out for periods of 10 and 14 weeks respectively on the two farms. Samples were taken weekly of the composite milk from each group of cows at both the morning and evening milking and analysed for fat and solids-not-fat.

The results, although as yet not conclusive, show a favourable response. On one farm the total milk, butterfat and fat percentage in the morning's milk were substantially improved, whilst on the other farm a consistent improvement in the fat percentage in the morning's milk was recorded. It is thus apparent that good hay grown in summer is a satisfactory roughage for use in winter feeding and has the desired effect of raising the fat percentage of milk during the critical period.

It is now proposed to carry out a feeding trial over a longer period, commencing in June, with larger quantities of variable quality roughage, to determine whether the quality and quantity are influential factors.

CHEESE.

Rapid Cheesemaking Techniques.

Cheddar cheese as commonly made in Queensland requires approximately 5-6 hours for manufacture. However, by dispensing with the cheddaring process and retaining the curd in the grain stage, a similar type of cheese can be produced in a shorter time. The application of such a method could thus help to effect economy in manufacture.

Trials to date in the making of a stirred curd variety of cheese have shown that the time for manufacture may be reduced by approximately 2 hours as compared with the normal cheddar variety. The resultant cheese was of good palatability and compared favourably in quality with first grade cheddar cheese but had a slightly granular texture. The new cheese is often more attractively flavoured at 2-3 months of age.

The method also allows the more ready application of mechanisation with the aid of curd-stirring devices during manufacture.

A new type of cheese starter culture (*Streptococcus durans*) has been obtained. This culture will allow of a high cooking temperature up to 115°F., thereby hastening the expulsion of moisture in the curd, and may assist the improvement in texture of the product. Other methods to be tried include a modification evaluated by the Commonwealth Scientific and Industrial Research Organisation and a technique developed in America.

Cheese-Milk Yielding Capacities.

Wide variations in the cheese-yielding capacities of milk delivered to several cheese factories have been recorded, coupled with seasonal defects in manufacture, and an investigation has been initiated at one factory to ascertain the principal causes. So far, it has been shown that variations in the casein content rather than in the fat are mainly responsible for variable cheese yields. The casein content over the past 12 months has varied widely from 2.15% to 2.72%, while the fat percentage varied only from 3.9% to 4.1%. The calculated cheese yield per 100 lb. milk varied from 9.86 lb. to 11.12 lb. An extensive variation in curd firmness which was noted appears to be due to the variations in the casein content.

The cows in the herds which supply this particular factory have shown some evidence of a phosphorus-deficient diet, and trials were initiated in conjunction with the Cattle Husbandry Branch to ascertain if the feeding of a calcium (slant) phosphorus rich concentrate might improve the quality of the milk for cheese manufacture.

The interim results show some improvement in the cheese-yielding capacity of the milk and a rise in the fat content, but no marked differences in the "casein stability" or curd firmness.

Farm Refrigerated and Tower Water Cooled Cheese-Milk Trials.

In order to ascertain the extent to which cheese quality may be improved by efficient cooling of milk on the farm, cheesemaking trials with refrigerated milk and also with milk cooled by the tower-cooling system were continued during the year.

The average grade of the cheese manufactured from the cooled and refrigerated milk was at least 1-2 points higher than that of cheese made from similar uncooled milk. Evidence was also obtained that cooling is no substitute for cleanliness. Both water-cooled and refrigerated milk supplies which were not cleanly produced failed to give a satisfactory methylene blue test. The effect of unclean methods of milk production tends to be greater in the case of refrigerated milk. The reason for this is that a low-acid system of cheese manufacture is normally most suitable for refrigerated milk, but if the milk is not of good quality, low-acid manufacture encourages the development of unclean and fruity flavours.

With milk cooled by the tower water cooling system, results indicate the need for more effective overnight holding temperatures. Consequently, the effect of holding the night's milk in an extension of the cool-water pit is being examined.

Mechanical Openness.

One of the most common defects in cheddar cheese is mechanical openness. A number of vats of cheese has been manufactured in co-operation with various factories in an endeavour to ascertain the chief causes. It has been found that by allowing a mellowing time of 40-45 min. between milling and salting it is possible to obtain

a close-textured cheese. However, other factors are being investigated, such as 2-day pressing and the stacking of the curd during cheddaring.

"Gassiness" in Cheese.

Considerable quantities of cheese from one large association were degraded because of gas produced by bacteria. The trouble assumed major proportions and caused great loss before the cause was located and removed. The defect became noticeable first in the curd at milling, when gas production rendered the curd spongy. Later, after pressing, the cheese became markedly blown, sometimes to the extent of bursting the bandage. Whilst slow vats were more blown than any other, even vats working normally and making 0.60-0.70% acidity at milling gave cheese which was blown on being removed from the presses.

Investigation showed that the trouble was caused by coliform bacteria, which were developing in pockets within leaking pasteuriser plates. When all leaks were detected and the holes welded the trouble ceased.

The investigations have also revealed the suppressive effect of coliform organisms on development of acidity in cheesemaking.

The possibility of coliform bacteria as another cause of open-texture in cheese is now under examination.

BUTTER.

Effect of pH on Keeping Quality.

Results obtained over the past six years on butters entered for an annual keeping quality competition have suggested that there may be some advantage in terms of keeping quality in adjusting the pH of the butter to an alkaline value. However, this trend required confirmation by properly designed experiments.

A limited number of trials conducted previously in this regard in commercial factories were of little value, as variations in the copper and iron content of the butters were sufficient to explain any variation in keeping quality. Experiments have now been commenced in conjunction with the Queensland Agricultural High School and College, where facilities on a pilot-plant scale can be provided. Under these conditions it is anticipated that previous difficulties can be overcome.

Churn Barrel Timbers.

It has been found that certain timbers recently used in the making of butter churn barrels deteriorate rapidly because of a fungus growth. In an endeavour to overcome this fault in locally produced butter churns, two churn barrels are now in operation to test the efficiency of a fungicide, zinc naphthenate. The treatment applied to the exterior of the churn timbers was three coatings of 20% zinc naphthenate and a final sealing coat of water-resistant plasticised resin.

One churn has now been in use for 10 months and the other for 2 months. Chemical analyses were done on cream, butter and buttermilk during the initial use of the first barrel, and the results show no zinc contamination. Regular inspections will be made of these barrels and comparisons made with the barrels already in use.

Butterfat Losses in Buttermilk.

In order to assess fat losses in buttermilk during butter manufacture, 398 churnings have been tested to date, and it has been shown that an average fat loss of 1.4% occurs. However, wide variation occurs irrespective of the different types of cream treatment units.

Churnings are being examined to determine the influence of pre-pasteurisation dilution. Typical results are as follows:—

Fat Percentage in Cream.	Fat Percentage in Buttermilk.	Percentage Fat Loss.
31.0	0.68	1.4
36.0	0.70	1.1

It is evident that as the fat content of the cream at churning increases there is a corresponding decline in the percentage fat loss. With a view to reducing dilution of cream in processing, some factories are now modifying their pasteurising equipment to provide for pre-heating of the cream. These modifications also effect other economies.

Trials to determine the influence of grain size in butter manufacture did not reveal any significant variation in fat loss with varying grain size.

Washing and Double Separation of Cream.

Reports from overseas have suggested that the keeping quality of cream may be prolonged by washing the normally separated cream with pure water, then re-separating. Trials on the practical value of the method have been undertaken in Queensland. Contrary to the results obtained in England and East Africa, the quality of the experimental creams in these trials was inferior to that of the normally separated samples.

With the washing out of a large proportion of the skim-milk fraction, the rate of acid production was markedly decreased. For example:

Trial.	Fresh.	4-day.	7-day.
Normal Cream	..	% 0.48	% 0.58
Washed Cream	..	0.15	0.16

The occurrence of an oxidised tallowy flavour in the washed cream, however, indicated that with the reduction in bacterial activity, as shown by the slow acid development, oxidation of the butterfat was enabled to proceed rapidly. Further, the removal of anti-oxidants in the skim-milk might predispose the cream to oxidation.

Softening Point and Iodine Values of Butter.

In conjunction with a study of the vitamin A content of Queensland butter by the Chemical Laboratory of the Division of Plant Industry, the samples are being analysed for Iodine Value and Softening Point in an endeavour to accumulate data on the chemical composition of butterfat for use in later experimental work. Butters from 12 factories included in the survey are being examined each fortnight.

MINOR INVESTIGATIONS.

(1.) A limited number of tests have been conducted using a tetrazolium salt as an indicator of low quality milk. This salt may have possibilities for the detection of abnormal milks.

(2.) A membrane filter developed in Germany and America for the detection of coliform bacteria in water is being tried for the detection of different types of coliform bacteria in milk.

(3.) The in-place chemical cleaning of factory equipment, as practised in many overseas milk pasteurisation plants, is being tried within the Brisbane milk district. The method, which has become a standard practice at one association, is claimed to effect greater economy by a saving in time and labour.

(4.) A bacterium affecting the quality of frozen milk is being investigated.

LABORATORY CONTROL SERVICES.

Laboratory control services dealing with butter, cheese and market milk have been expanded during the year.

The Butter Improvement Service was established to give factories regular information on the chemical and bacteriological quality of butter produced together with suggestions for improvement. These results have done much to ensure the hygienic production of butter of a uniform standard of composition, with a consequent economic benefit to the industry.

Continued technical aid has been given the cheese industry. There is now a wider use of single-strain starter cultures distributed by the laboratories and the incidence of bacteriophage has been reduced.

The laboratory control services have been expanded to meet the growth in the market milk industry, and as a result there has been some improvement in production methods, processing standards and quality of milk for human consumption.

There has been an increasing appreciation by the industry of the desirability of converting milk by-products into human foodstuffs instead of using them for animal feeding. With the drying of separated milk and buttermilk now more widely practised, numerous samples of these powdered products have been received for analyses to ensure uniformity of quality and composition. Fineness, extraneous matter, composition and solubility are matters upon which advice has been tendered for improvement of quality. The industry has appreciated the value of the technical services, as is evidenced by their efforts to comply with the advice given.

Butter Improvement Service.

The examination of butter samples under the Butter Improvement Service was continued during the year to provide the information necessary for control and advisory services.

Bacteriological.—A total of 1,957 samples of butter was examined bacteriologically at the Hamilton laboratory and resulted in an average Bacteriological Quality Index of 230 out of a possible 400. This figure represents a reasonably good overall standard of hygiene in the butter factories.

Coliform Tests.—In view of complaints that some butter exported did not comply with the importing country's standards in that *Escherichia coli* was present, efforts are being made to determine the proportion of this type of organism in butters showing positive presumptive coliform tests. In the past year 60% of the samples examined gave a negative presumptive coliform test in 1/10 ml. of butter.

Microscopic Examinations.—The microscopic examination of butter has now become firmly established as part of the routine. The results of the 4,098 samples examined since the method was put into regular use show that the distribution of moisture was very satisfactory in 76.4% of the samples. Only 382 samples (9.3%) were classified as "very underworked," and of these 45 samples (1.1%) were associated with defects of texture or condition which caused comment or penalty when the butter was graded. These figures show a high overall standard in the manufacture of Queensland butter; the microscopic examination of butter is a more sensitive indication of variations in manufacture than the usual method of butter grading. A feature now emerging from the results is that the tendency to under-work butter varies with seasonal conditions. Fig. 1 shows this seasonal trend to be most marked in the late autumn-early winter months; it was particularly noticeable in 1954 when after the late summer rains there was a marked drop in production in April and May due to the rapid deterioration of the pastures. Such conditions cause changes in the composition of the butterfat, and the microscopic examinations have shown which factories were least successful in adjusting their manufacturing technique to the changes. Appropriate advice is being given to these factories and a pamphlet has been published dealing with the theoretical and practical implications of the microscopic examination.

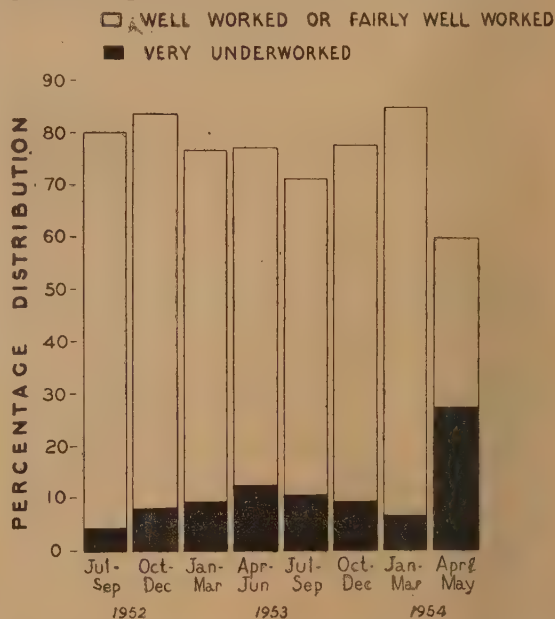


Fig. 1.

RELATIONSHIP OF UNDERWORKING OF BUTTER AND SEASON.

Recently acquired photomicrographic equipment is proving valuable in this work. Plate 1 in the report of the Director of Dairying shows the appearance, using phase contrast illumination, of the causative organism of the "rabbito" defect in a water droplet in butter.

Chemical.—Determinations on 1,959 samples showed the average composition of butter to be:—moisture 15.58%; salt 1.34%; curd 0.85%; fat 82.23%. These figures indicate that Queensland butter conforms to a

good standard of composition and that a worthwhile effort is being made generally by most factories to produce butter most economically.

The estimations of the pH of the butter serum showed an even more definite trend to alkaline butters than in the previous year. The results of the two years are compared in Table 1.

TABLE 1.
pH—DISTRIBUTION OF RESULTS.

Year.	No. of Samples.	Percentage of samples within range :—					Arithmetic Mean.
		5.8-6.7	6.8-7.2	7.3-7.5	7.6-7.9	8.0-8.7	
1952-53	1,172	8.0	27.0	30.7	26.7	7.6	7.36
1953-54	981	1.4	11.5	24.2	46.2	16.7	7.63

The number of samples with pH values below 6.8 is now negligible, a desirable feature in terms of keeping quality.

Extraneous Matter.—With increasing attention overseas to the presence or absence of any foreign matter in butter, regular extraneous matter examinations have been commenced. The results to date are, however, being regarded as exploratory.

Field Work and Advisory Services.—Forty surveys of butter factories, conducted by laboratory officers in association with field officers, were aimed at overcoming specific problems, such as bacterial contamination, degrading of butter, and manufacturing difficulties.

Butter from three factories was affected with "chemical taint" during the year. In two of these factories the cause was traced to the action of chlorine, used for sterilization of water, with traces of phenolic substances from bitumastic compounds used on water reservoirs. The third case was due to flooding of the factory dam with its consequential contamination by decaying vegetable matter which tainted the cream per medium of the steam used for pasteurisation.

A further interesting feature was the simultaneous occurrence of oily and "rabbito" flavours in different churnings from one factory. It was shown that the oily flavours were caused by heavy copper contamination, but in some cases their development was held in check by the action of the causative organism of "rabbito" butter.

Following reports of the serious corrosion of pasteurising equipment through the misuse of chlorine solutions as a chemical sterilant in dairy factories, a circular outlining recommended procedures for chlorine sterilization was forwarded to every factory.

Laboratory Quality Control of Market Milk.

The laboratory control of market milk has been intensified at the Brisbane, Toowoomba, Murgon and Malanda laboratories and has involved four aspects—

- (1) The critical examination of the condition of the milk when it arrives at the processing depot.
- (2) Its sampling to permit the investigation of its response to pasteurisation (*i.e.*, its pasteurisability).
- (3) The bacteriological examination of the efficiency of plant equipment, cleaning and sterilization.
- (4) The bacteriological control of the pasteurised product.

Table 2 summarises the results obtained in comparison with the previous year.

TABLE 2.
SUMMARY OF MILK EXAMINATIONS.

	1952-53.	1953-54.
Platings—bottled pasteurised milk	1,336	1,782
Presumptive coliform tests	1,270	2,790
Phosphatase tests—		
Number	1,068	1,564
Percentage negative	99.5	98.4
Microscopic examinations	5,956	8,333
Methylene blue tests at depots—		
Number	75,502	227,845
Percentage below 4 hours	3.7	6.1
Fat tests at depots—		
Number	32,028	79,031
Percentage below 3.3%	7.6	4.9
Pasteurised milk fat tests	1,232	1,702
Average fat percentage	3.83	3.91
Bulk milks received from country depots		
Methylene blue tests	6,023	5,825
Fat tests	5,451	5,639
Factory surveys	60	80

Raw Milk Quality.—The increase in the number of methylene blue tests performed on raw milk supplies at processing depots, while due partly to the establishment of regional laboratories, emphasises the keenness of associations to improve the quality of milk for pasteurisation purposes. The quality of the raw milk has been well maintained, despite the extension to new areas for market milk supplies. Smears of sub-standard milk are forwarded to the laboratories for microscopic examination, and advice on faults in quality, possible causes and remedial action is then sent to producers.

Numerous raw milk supplies have been examined for fat, milk solids, freezing point and bacteriological quality to ensure a high standard of quality for processing purposes.

Using the roll-tube method, milk supplies have been examined for thermophilic or heat-tolerant bacteria which survive pasteurisation. High counts of these bacteria are an indication to producers that equipment should be checked with a view to reducing contamination.

The bacteriological examination of rinses of dairy farm equipment is being carried out, where necessary, to detect sources of contamination likely to affect milk quality. The technique is one which is regularly practised under the National Milk Testing Service in England.

Where farmers have installed refrigerators, results show that, whilst the temperature of the milk has been satisfactorily reduced, there has been a tendency for some milk producers to rely on cooling temperatures without first effectively cleaning dairy equipment. Consequently, some results have not been as good as expected.

With the increasing use of road tankers to transport milk from country depots, regular chemical and bacteriological tests have been carried out to see that standards of quality are maintained in bulk milk supplies.

Pasteurised Milk Quality.—The high percentage of negative phosphatase tests recorded indicates a generally good standard of efficiency in processing. The few positive tests have been traced back to leaking pasteurisers or to incorrect temperature control.

Samples of bottled pasteurised milk have been collected daily from the processing depots and subjected to the following tests—plate count, presumptive coliform, phosphatase, butterfat, total solids, and keeping quality. As most high plate counts recorded are due to heat-tolerant bacteria in the raw milk, and as these bacteria have little effect on quality, less emphasis is now being placed on this test as an index of processing efficiency. The keeping quality test, wherein the milk is held for 18 hours at 68°F. prior to testing with methylene blue, seems more reliable and has indicated a generally good keeping quality for pasteurised milk.

Compliance with a negative coliform test in 1 ml. samples still presents a problem for some processing plants, although the splendid efforts of some factories indicate that it is possible to produce a milk free of coliform bacteria in 1 ml. samples, with a corresponding improvement in keeping quality.

The compositional quality of market milk, including the fat and solids-not-fat, has been well maintained, but drier seasonal influences during the first half of the year affected milk composition.

In all, 80 bacteriological surveys were made of milk pasteurisation plants and these have enabled factories to pin-point sources of contamination likely to affect quality, including faults in pasteurisation, bottling, bottle-washing or can-washing.

Regular testing to ascertain the sterility of washed milk bottles shows an improvement in the efficiency of bottle-washing.

Testing of Samples for the Commonwealth Government.—During the year, the Laboratory has tested samples weekly for the immigration authorities and the Defence Forces. The samples were tested for total count, *E. coli*, phosphatase, added water, butterfat, total solids, and keeping quality. The standards demanded for this milk are high, and the majority of processing firms are consistently supplying milk conforming with them.

School Milk.—With the introduction of the Milk-in-Schools scheme, samples have been regularly taken and tested under the laboratory quality control service, and the results have shown a generally good standard of quality.

Cheese Improvement Service.

The Branch has continued to supply high quality cheese starter cultures to all cheese factories in the State, a total of 955 cultures being distributed during the year. The starter service provided has been appreciated by the industry and more single-strain cultures are in use than ever before. Aided by the distribution of more vigorous strains and precautionary measures in subculturing in the factories, the incidence of starter failures in manufacture due to bacteriophage has been reduced. In keeping with overseas developments, the freeze-drying of starter cultures has been undertaken and their suitability for distribution to factories is under consideration. The improved freeze-drying equipment illustrated in the report of the Director of Dairying now installed will allow the method to be fully tested under field conditions.

Factors other than bacteriophage which are likely to cause delayed acid development in cheesemaking have been studied. For example, considerable variations have been recorded in the results of vitality tests conducted with raw milk drawn aseptically from the cow and the same milk after pasteurisation. The results were more marked with the "eremoris" strain than with the "lactis" strain of starter cultures. A paper dealing with the effect of antibiotics in milk in the cheesemaking process is now in course of preparation.

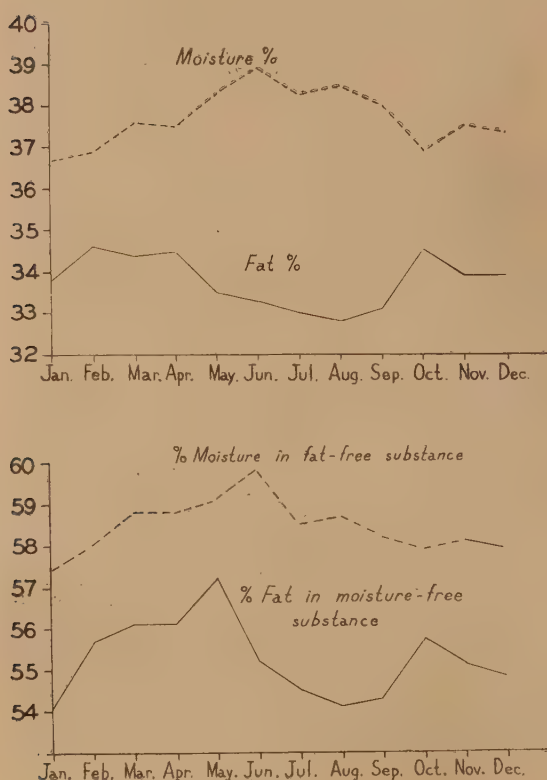


Fig. 2.

SEASONAL VARIATION IN COMPOSITION OF CHEESE.

The quality of cheese bears a close relationship to its composition and the quality of the milk from which it was made. A total of 108 samples of cheese has been analysed to ascertain composition and conformity with standards laid down in the Dairy Produce Acts. Fig. 2 illustrates the seasonal variations which occur in the composition of cheese. It is interesting to note that in January both the percentage of fat in the moisture-free substance and the percentage of moisture in the fat-free substance are at their lowest value for the whole 12 months. This indicates that the chemical composition of the curd at this period is such that it is unable to hold moisture to the same extent as in other months. The relationship between this anomaly and variations in the quality of the milk received is under investigation. The cheese-yielding capacity of the milk and butterfat losses during manufacture are being examined. The information so obtained affords a close check on the efficiency and economy of manufacture. To facilitate

the accurate sampling of milk for cheese yield determinations, a special apparatus has been designed and made to fit the milk line. The accuracy of this method is now being compared with other methods of sampling.

The in-place chemical cleaning of cheese milk pasteurising equipment has been tried because of the consequent economic advantages. The procedure in which nitric acid is used was found to be unsatisfactory if the factory water supply was high in chlorine content. In such cases, corrosion of equipment was probable and the procedure had to be modified.

A total of 47 visits was made to cheese factories for the purpose of conducting surveys and tendering advice for the further improvement of quality. It was encouraging to see that some factories had adopted measures to reduce mould growth on cheese and bacteriophage infection of starter cultures by the use of ultra-violet light in cheese holding rooms and starter rooms.

Milk and Cream Quality Improvement Demonstrations.

From funds provided by the Commonwealth Dairy Industry Extension Grant, techniques are being demonstrated which may assist to improve the quality of milk and cream.

Cleaning and Sterilizing Dairy Equipment.—Three methods of cleaning and sterilizing milking machines are being demonstrated on 12 farms throughout the State. They are:—

- (1) The use of soda ash with a wetting agent in hot solutions.
- (2) The use of soda ash with a wetting agent in lukewarm solutions (110°F.).
- (3) The use of 1% caustic soda with 0.1% sodium sulphite in cold solutions together with the wet-storage of the teat cup assemblies.

Bacteriological results with each method have been satisfactory. However, the inclusion of a wetting agent in methods 1 and 2 would seem to give improved rinsability and be beneficial where hard water supplies are used. The inclusion of sodium sulphite in method 3 would reduce corrosion. The absorption of the fat was reduced with the wet-storage technique and the quality of the rubberware has been well maintained. Because of the economic advantages in being able to effectively cleanse milking machines in hot or cold detergents without dismantling, further investigations are planned. A combination of method 1 in assembled equipment with the wet storage of the teat cups in method 3 offers promising results. As hard water supplies in Queensland present a problem on many farms, a further combination under trial includes the daily cleaning with an alkali solution and the use once weekly of an acid detergent to prevent the build-up of milkstone. Preliminary results of using citric acid once weekly indicate that this preparation may be more effective than phosphoric acid for the removal of milkstone.

Quality of Dairy Rubberware.—The quality of dairy rubberware has caused concern in the industry in recent years. Investigations have shown that some brands rapidly deteriorate because of susceptibility to fat saturation, which adversely affects the quality of dairy produce. It has also been suspected that high temperatures in cleaning solutions have hastened rubber deterioration. With a view to extending the life of rubberware, trials with a cold wet-storage soak in 1% caustic soda plus 0.1% sodium sulphite were commenced, and to date the method has given satisfactory results. Consideration is being given to modifying the design of teat cup inflations. Trials have also been extended to testing rubberware of varying composition and samples made to four different specifications are being tried. These include synthetic rubbers, natural rubber and various combinations with carbon black as a filler. The combinations may reduce the degree of fat absorption of the rubber.

Farm Cooling of Milk and Cream.—Because of Queensland's warm climatic conditions, attention has been given to evolving efficient yet economic methods for cooling milk and cream on the farm.

The reduction in milk temperature that can be achieved by employing the principle of natural evaporative cooling is well illustrated in Fig. 3.

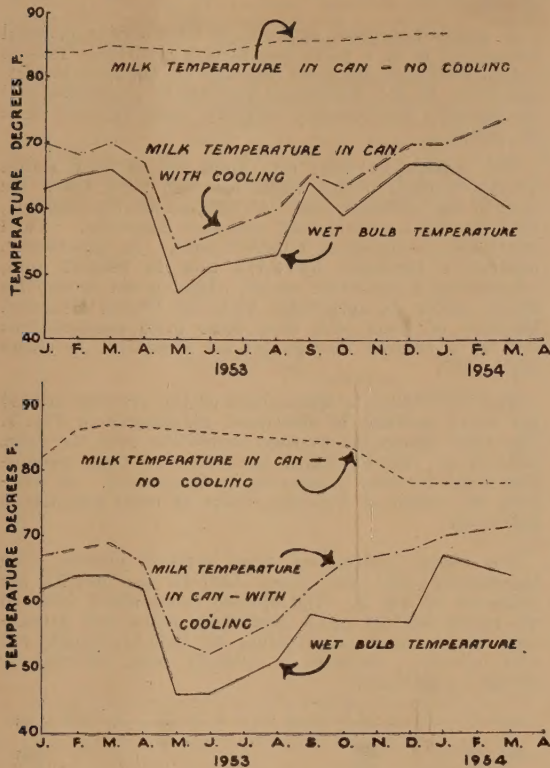


Fig. 3.

TEMPERATURES OF MORNING AND EVENING MILK.

To provide cool storage, as well as the immediate removal of animal heat, an extension of the cool-water pit has been designed to hold milk or cream overnight. For cream cooling, a smaller, less costly, water cooling tower has been designed and will be tested during the approaching summer months.

Cream Quality.—In one district a conspicuous off-flavour in cream, which, it is claimed, has become more prevalent each year, has been reported. The characteristic off-flavour appears to be fairly widespread and occurs on a number of farms which follow hygienic practices in production. The defect has been traced to the freshly drawn milk of some cows. Twice-daily feeding of a mineral-enriched concentrate to cows whose milk is affected has improved flavour. The effect of this feed on milk quality is now being further examined.

Survey of Dairy Factory Water Supplies.

With the object of developing efficient and economic methods of water treatment, the survey of factory water supplies has been continued. Waters from 45 butter factories and 30 cheese factories, 91 samples in all, were analysed during the year, treatments were worked out experimentally and some were applied under field conditions. Regular analyses have shown that seasonal conditions effect a marked change in composition, necessitating the application of a careful control system.

ANALYTICAL.

A total of 1,080 samples was submitted for general analysis. They included milk, skim-milk, buttermilk and whey and their powders, butter, cheese, cream, margarine, waters, detergents, sterilizers, scales, brines and miscellaneous samples. As usual, analyses were made both for advisory purposes and in connection with current investigations.

A total of 11,109 pieces of dairy glassware was tested for compliance with the requirements of the Dairy Products Acts. This represents an increase of almost 2,000 on the previous year and is indicative of a better supply of glassware being available for the needs of the industry. A very pleasing feature is the considerable improvement in quality recorded for the year, only 1,076 pieces (9.7%) being rejected for failing to meet the necessary standards, as against 30.5% in the previous year.

PUBLICATIONS.

Eight papers were prepared for publication during the year and four others are in course of preparation.

Officers of the Branch have also given a number of lectures to dairy conferences, assisted in the preparation of show exhibits, and delivered radio talks.

MARKETING BRANCH.

Mr. H. S. Hunter, Director of Marketing.

MARKETING.

The work of the Branch in the fields of organised marketing and statistical and economic analysis has brought it into close contact with the vital changes now taking place in rural industry. The advisory and other duties which officers are required to perform as members or deputies on commodity marketing boards, together with the preparation of analytical material on a wide range of rural products, necessitate a very close study of trends in the economic and specifically the marketing field so that information and advice can be as up-to-date as possible. With the passing of the post-war phase, the emphasis is no longer on shortages of labour and materials, on the lack of supply of commodities themselves, or on controls of various kinds, but on the more direct problem of selling and prices. Gradually over the past few years it has been possible for officers to turn their attention more and more to the development of economic and statistical services, the foundations for which were established after the war. These are dealt with in the latter part of this report.

Overseas Markets.

So far as marketing is concerned, the trend has continued towards more difficult conditions for a substantial portion of rural industry. Particularly has there been a deterioration in the overseas position. Supplies have markedly improved, stocks have built up to high levels, whilst demand has been curtailed because of currency difficulties or the direct and indirect influences of the cessation of hostilities in Korea. Weakening of some prices has been the inevitable result.

The outlook for dairy products, eggs and grains is very uncertain. Sugar export markets are no longer expanding and a carry-over has resulted from the above-average season. Fruit, of which the chief exports from Queensland are apples and canned pineapples, face uncontrolled markets (although the 1953 pack of canned pineapple was bought by the United Kingdom Ministry of Food at satisfactory prices).

Not only has the condition of the market altered, but its structure has also undergone a radical change. Government-to-Government trading no longer dominates the scene and the security which contracts between the United Kingdom and Commonwealth Governments gave to certain commodities such as butter and eggs is being lost. Moreover, the International Wheat Agreement is no longer a very potent stabilising factor in the world's wheat markets.

TOTAL VALUE OF QUEENSLAND PRODUCTION

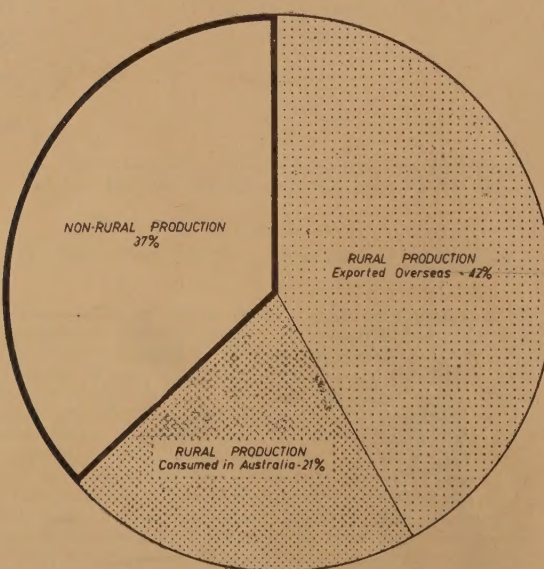


FIGURE 1.

DISSECTION OF VALUES OF QUEENSLAND PRODUCTION, 1947-48 TO 1951-52.

In contrast to many agricultural commodities, pastoral production is in a more satisfactory position. This is indeed fortunate, for these products are the most important items in the Australian balance of payments, and consequently the economy virtually rests on their level of values.

The Australian wool clip from the 1953-54 season totalled 3,804,278 bales, which was only 1.2% below the level of the previous year. As regards meat production, 1953-54 was a near record year for Australia. Total production is stated at 1,151,675 tons. In Queensland, production increased by 8,174 tons to 300,523 tons, establishing a new State record. Meat is one commodity which, under an agreement with the United Kingdom Ministry of Food, will have some price guarantee as well as a secured market for all exportable surpluses until 1967.

The importance to Queensland of the overseas market for rural products is illustrated graphically in Fig. 1. The chart shows the average proportion over the years 1947-48 to 1951-52 which the value of rural production bears to total production in Queensland. In addition, the extent of overseas export of rural products is indicated.

The actual realisations from overseas exports from Queensland over the years 1947-48 to 1952-53 are indicated in Fig. 2. The upward trend which followed the rising level of prices over these years, and particularly the boom in wool values of 1950-51, stands out very clearly. Exports in 1951-52 were affected by drought conditions.

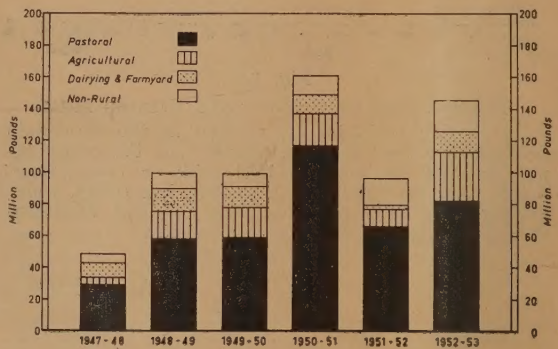


FIGURE 2.

EXPORT REALISATIONS FROM QUEENSLAND INDUSTRY, 1947-48 TO 1952-53.

Organised Marketing.

The work of the Marketing Branch cannot but be affected by these developments. The impact on some of the marketing boards set up under the various Acts administered by the Division is of course direct.

In the dairying industry, butter and cheese contracts extend to 30th June, 1955, but it is quite certain that severe competition may be expected from other exporting countries as well as buyer resistance, particularly as the *per capita* consumption of margarine in the United Kingdom is now 18.2 lb. per year, compared with 8.7 lb. pre-war.

Eggs are now sold on a free market in the United Kingdom, and a serious fall in prices—from 3s. 10-875d. and 4s. 5-625d. per dozen f.o.b. in 1952-53 to 3s. 2-174d. and 3s. 6-436d. per dozen this year for the 14 lb. and 16 lb. packs respectively—was experienced.

The international grain market has changed radically in character during the past 18 months. Wheat, barley, grain sorghum and maize have all been seriously affected. Carry-over from the 1952-53 crop in the United States alone totalled 559 million bushels, while Canadian and Australian carry-over at the end of the 1952-53 season totalled 369 million and 36 million bushels respectively. A new International Wheat Agreement is now in operation, but the withdrawal of the United Kingdom, Italy and Sweden has reduced the total quantity of wheat covered to 389 million bushels, compared with

581 million bushels under the 1949-53 Agreement. A further reduction will result from the stated intention of India not to take its full quota of 55 million bushels. This means that only about one-third of all wheat normally entering international trade is now under the Agreement, and this proportion is too small to ensure much stability for wheat prices. Maize prices have fallen from approximately 13s. 9d. per bus. f.o.b. in 1952-53 to 11s. 0d. per bus. 12 months later. Overseas grain sorghum prices have fallen from £25-£26 per ton f.o.b. to approximately £15-£16 per ton. An illustration of the manner in which grain prices have fallen during the last 18 months is given in Fig. 3. This shows in Australian currency the course of free market prices for Northern Manitoba No. 1 wheat since January 1953.

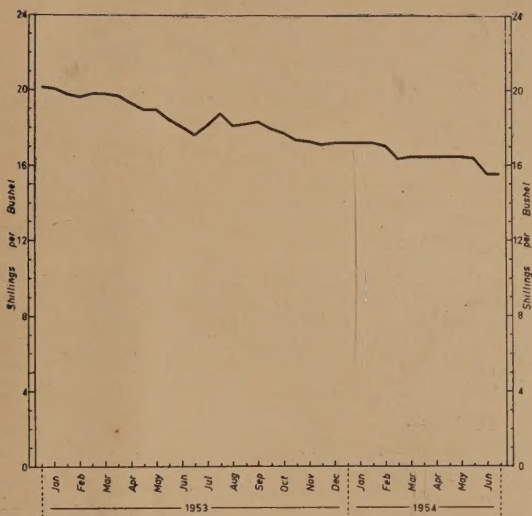


FIGURE 3.

FREE MARKET PRICES IN AUSTRALIAN CURRENCY FOR NORTHERN MANITOBA NO. 1 WHEAT, JANUARY, 1953 TO JUNE, 1954.

The influence of the overseas market situation on other boards has been less direct but none the less important. World prices for peanuts of between 1s. 2d. and 1s. 5d. per lb. (excluding duty) main ports are considerably below the Peanut Marketing Board's selling price of 1s. 10d. per lb. f.o.b. Brisbane. To conform with the steep fall in world edible oil prices, oil kernels have been reduced to 9d. per lb. as against 1s. 1d.

per lb. in 1952. Ginger may also be quoted as an example; a recent quote for imported ginger in Sydney was 1s. 6d. per lb. Sydney, whilst the Ginger Marketing Board's Sydney price was 2s. 4½d. per lb.

With the marketing position as described above, it is only natural that great importance should attach to the two Queensland crops which are produced in quantities that are only a fraction of Australia's requirements—tobacco and cotton.

There has again been considerable activity in regard to the tobacco industry. Prices realised in Queensland to date for the current season are considerably higher than in previous years, the average to 30th June being 145-97d., compared with the previous record average of 105-21d. for the 1950-51 crop and 103-21d. for the 1952-53 crop. Fig. 4 shows the changes in production and prices of tobacco leaf in Queensland since 1945-46 and clearly reveals the manner in which production of this crop has reacted to increased prices.

A very important factor in the marketing of Australian tobacco leaf is the fixation of percentages of Australian leaf for inclusion in blends before manufacturers can qualify for concession tariffs on imported leaf. The policy, recently adopted, of announcing changes in these percentages sufficiently far ahead to allow for maturation of leaf before manufacturing must prove of benefit to both manufacturers and growers. The stabilisation of the industry on a firm basis so that growers can have confidence to maintain and expand production is the most urgent need of the industry.

In the course of their duties during the year, officers have attended conferences, attended meetings of the Tobacco Cost of Production Committee and the Tobacco Advisory Committee, and visited tobacco factories. Real progress has been made by The Tobacco Leaf Marketing Board in co-operation with the Department and manufacturers in connection with matters relating to quality, whilst the possible achievement of a stabilisation scheme has been brought closer by the completion of the cost-of-production survey carried out by the Bureau of Agricultural Economics. It is expected that at an early date further discussions will be arranged so that details of the stabilisation scheme can be elaborated.

The 1953 cotton harvest was the largest since the war and produced 4,229 bales of raw cotton lint, compared with only 1,483 bales the previous year. The 1954 crop was unfortunately set back by floods in February and production may not exceed 2,800 bales of raw cotton lint. World cotton prices vary almost daily. The Cotton Marketing Board's selling price to Australian users is based on c.i.f. equivalent calculated from New York spot prices every Friday (i.e., the Board's price is varied weekly and is directly dependent on world prices).

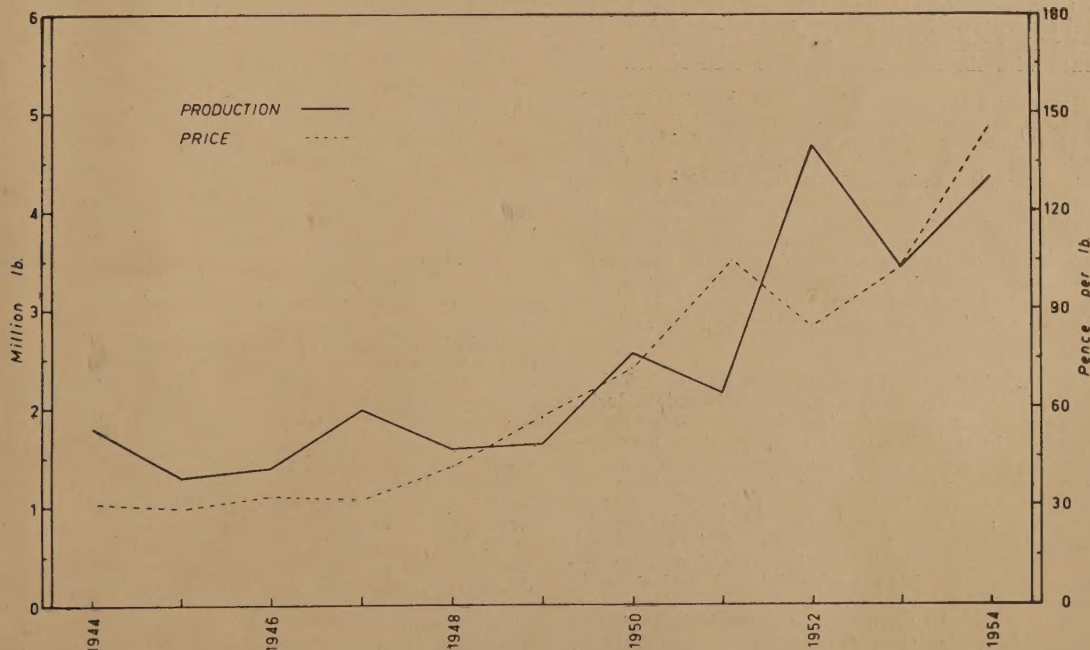


FIGURE 4.

PRODUCTION AND PRICE REALISATION OF QUEENSLAND TOBACCO LEAF, 1944 TO 1954.

Cotton, however, is assisted by a guaranteed price which is made effective by means of a bounty. The present guaranteed return is 14d. per lb. of seed cotton for grades above strict good ordinary.

In addition to the foregoing review of marketing developments during the year 1953-54, a detailed description of the activities of the various commodity marketing boards operating in Queensland will, as in previous years, be given in the Annual Report by the Director of Marketing to the Hon. the Secretary for Agriculture and Stock, as required by "*The Primary Producers' Organisation and Marketing Acts, 1926 to 1951.*"

STATISTICS AND ECONOMIC ANALYSIS.

One of the most important phases of the Marketing Division's work is the Crop Forecasting Service, which is conducted under the immediate supervision of the Assistant Director of Marketing (Mr. C. H. Defries). The task of establishing, operating and, as circumstances permitted, expanding a system of crop reporting and forecasting was made the responsibility of this Division in 1946. The first report—on the South Queensland autumn potato crop—was issued on 18th April, 1947. From time to time other industries were incorporated in the system, which now embraces potatoes, wheat, maize, grain sorghum, barley, peanuts, tobacco and poultry. During the year ended 30th June, 1954, 24 reports were issued on these commodities.

The information in these reports and the forecasts of production are based primarily on data supplied by honorary crop correspondents. These are farmers who are actively co-operating with the Branch in this work by providing reports as requested on the progress of crops in their localities. By personal communication in this way with over 700 selected farmers in practically every significant locality in the State, the Branch is in a unique position for assessing trends and prospects in these industries. This very extensive field organisation ensures a practical and comprehensive approach to the problems of crop forecasting, and enables forecasts to be made with a degree of confidence which would be lacking without this intimate contact in the field. Experience has shown that forecasts and estimates made on the basis of a few general observations whilst passing along the highways are mostly unreliable.

The continuing co-operation and goodwill of the producers themselves is essential in the maintenance of an effective crop forecasting system. The officers responsible for the preparation of the reports and the statistical calculations which precede the forecasts take every opportunity which time and other duties permit of visiting the main localities in which these crops are grown, establishing personal relationships with crop correspondents and acquainting themselves with local conditions. These officers also maintain close contact with farmers' leaders and trade connections concerned with the marketing of these commodities.

Honorary crop correspondents were appointed largely on the recommendations of field officers of the Division of Plant Industry or, where they exist, marketing boards established under legislation administered by the Marketing Branch. Some have been appointed on the suggestion of other honorary crop correspondents, and some, having become aware of the work, have volunteered. Others have been approached because they were located in a strategic locality. In the case of the reports on the poultry industry, the honorary poultry correspondents were selected on a stratified random selection principle, for reasons which will be explained later.

Correspondents for agricultural crops are asked to complete, generally, three or four questionnaires during the crop season. The required information relates to conditions in their immediate locality, which may comprise, depending on location and commodity, anything from perhaps five to 20 farms. As well as the "locality-judgment" type of information, correspondents are also asked for specific information relating to acreages, yields, etc., on their own farms, but this latter type of information is designed for subsequent analysis and is not taken into calculation for the purpose of the forecasts. The correspondents have not been selected on the random basis, which would be essential if their "own farm" data was to comprise the sample. The requirement of "randomness" does not apply where locality-judgments are the basis of the forecasts. In fact, success on this basis is largely

dependent on careful selection of localities to be included in the sample, this depending on prior statistical analysis of production and area records, and equally careful selection of the farmer or farmers to report on this locality. Production trends are kept under close surveillance to ensure that the locality-sample remains representative.

The structure of the poultry industry is such as to render the concept of "locality-judgments" inappropriate. It is a comparatively simple matter for, say, a wheat grower to estimate the percentage by which plantings in his locality have risen or dropped compared with the previous season. There are only a limited number of paddocks for him to keep under observation. It was felt that the dynamic nature of the poultry industry made this type of sampling impracticable. A poultry flock can be significantly increased or decreased within a very short time to a degree which would be quite impossible to an agricultural producer who has natural limitations on his acreage and who is practically committed with respect to land usage once his sowing is completed. Hence, honorary poultry correspondents have been selected on a "stratified-random" basis and report solely on conditions on their own farms. Poultry questionnaires are completed monthly: detailed information is required quarterly, whilst the intermediate reports are designed solely to ascertain average rates of lay.

As the poultry industry is sampled on the basis of single-farm observations, the number of poultry correspondents is considerably greater than the number appointed for agricultural crops. The number of active correspondents in connection with each type of forecast is as under:—

Poultry—						
Farmers	..	..	..	..	..	297
Hatcherymen		..	..	..	..	24
						— 321
Grain sorghum	..	..	..	..	..	123
Wheat	..	..	..	..	..	121
Maize	..	..	..	..	..	85
Peanuts	..	..	..	..	..	85
Potatoes	..	..	..	..	..	52
Barley	..	..	..	..	..	50
Tobacco	..	..	..	..	..	27

The total number of honorary correspondents is 736. This number does not agree with the total of the numbers shown against the individual items listed above, which is 864. The disparity is caused by the fact that some grain correspondents report on two, three, and in some cases, even the four grains.

Honorary crop and poultry correspondents receive no remuneration for their work. They are provided, however, with prepaid envelopes in which to enclose their reports and they are automatically placed on the distribution list for the Reports and Forecasts issued in respect of the crops on which they report. In addition, information on economic and marketing matters likely to be of interest to farmers—often extracts from overseas publications on agricultural economics—is prepared from time to time and distributed to them. It is hoped in this way, and by visits to their farms by marketing officers whenever practicable, to ensure a continuance of their co-operation and goodwill.

Analysis of honorary crop correspondents' reports and other data collected since the commencement of crop forecasting by this Branch has proceeded throughout the year with the object of refining the statistical techniques in use. This type of analysis is involved and time-consuming, and has not yet proceeded to the stage where any significant ratios have been established between reported and actual conditions. One of the important aspects being investigated is the ratio between forecasted yields per acre and subsequent actual yields. Table 1 is an example of the facts that are emerging from the analysis. This indicates the percentage which the average forecasted yield per acre by honorary crop correspondents in the main local authority areas bore to actual recorded yields per acre for each of the wheat crops since the Crop Forecasting Service was instituted. This establishes that honorary crop correspondents in the wheat growing areas have tended to over-estimate yields.